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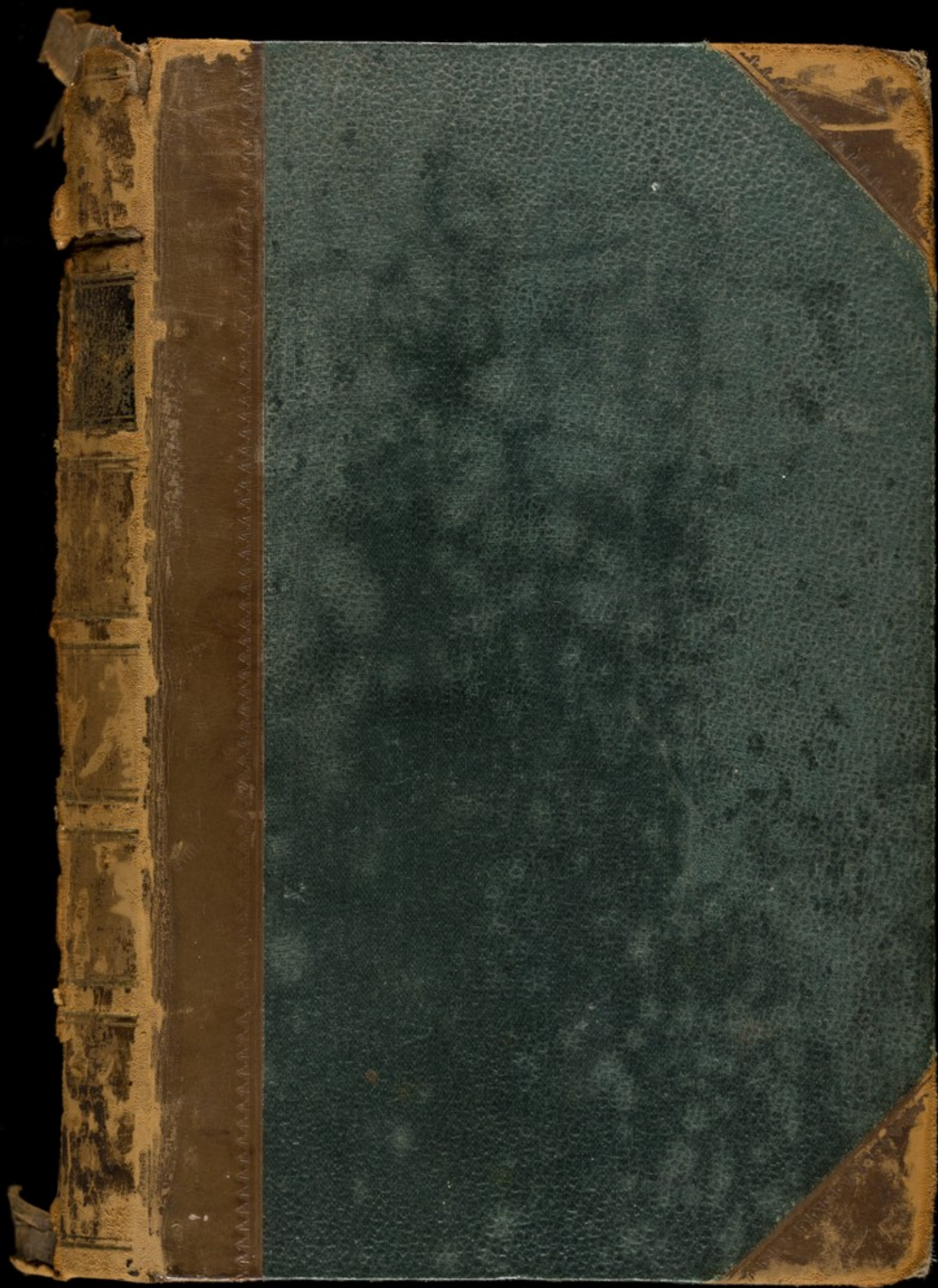
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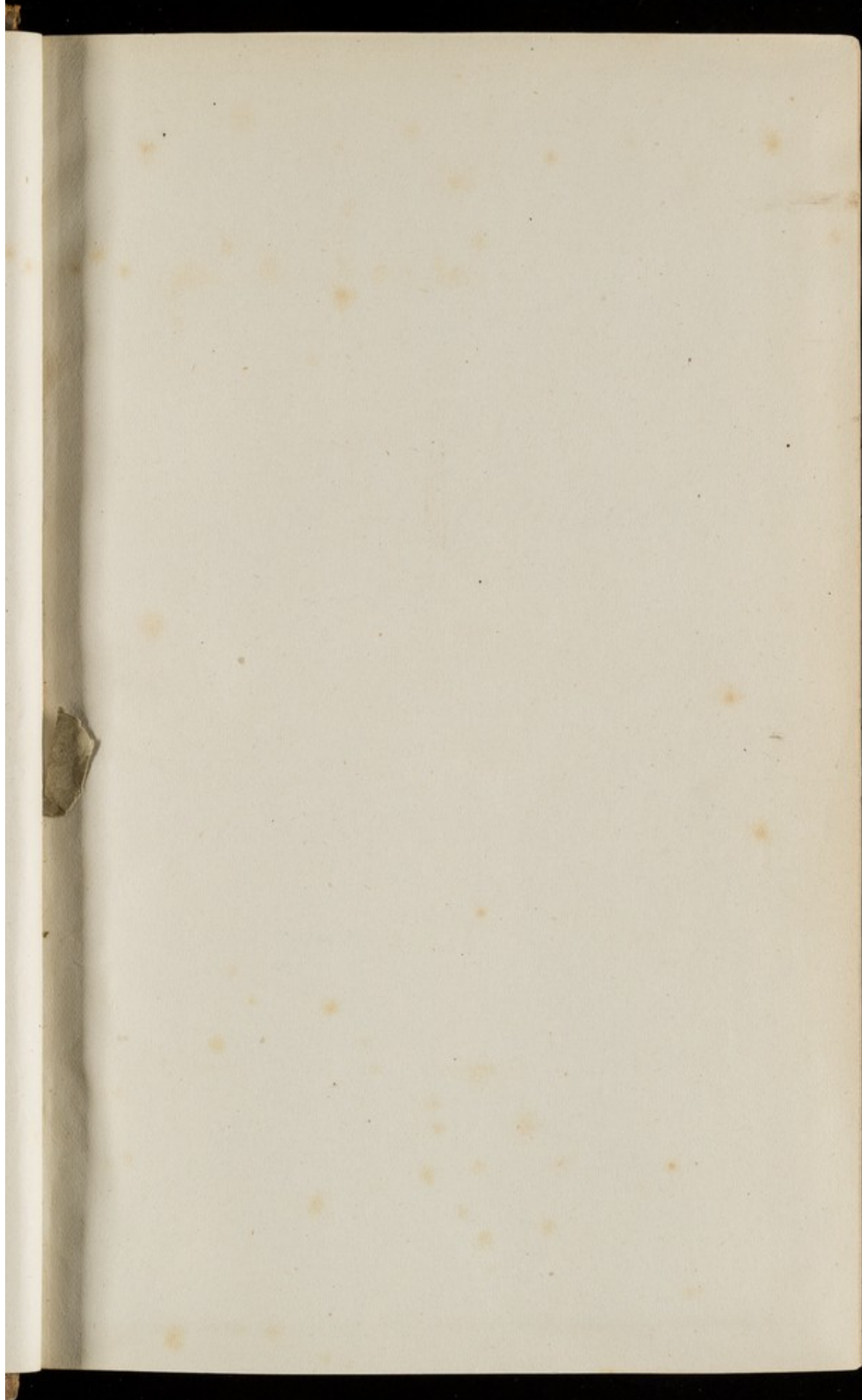
Sir Thomas Longmore.

RAmC 423/2

Vol. 2



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OFFICE BEARERS FOR THE FIRST YEAR OF  
THE SOCIETY'S FORMATION

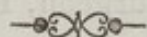
# RULES & REGULATIONS

OF THE

ARMY

# MEDICAL & SURGICAL

SOCIETY.



FOUNDED

A.D. MDCCCLVI.

OFFICE BEARERS FOR THE FIRST YEAR OF  
THE SOCIETY'S FORMATION.

President,

Dr. ANDREW SMITH, Director General.

Vice-Presidents,

Dr. JOHN HALL, K.C.B. Inspector General.

Dr. DUMBRECK, C.B. Deputy Inspector General.

Mr. TAYLOR, C.B.       "       "       "

Dr. MACLACHLAN,       "       "       "

Treasurer,

Mr. BLENKINS, Surgeon, Grenadier Guards.

Honorary Secretaries,

Mr. MOUAT, C.B. Deputy Inspector General.

Mr. WYATT, Surgeon, Coldstream Guards.

Council.

Dr. GIBSON, C.B. Deputy Inspector General.

Dr. LOGAN, Deputy Inspector General.

Dr. MONRO, Surgeon Major, Coldstream Guards.

Dr. BOSTOCK, Surgeon Major, Scots Fusilier Guards.

Mr. PILLEAU, Staff Surgeon, 1st class.

Mr. MAC GREGOR, Staff Surgeon, 1st class.

Dr. BALFOUR, Staff Surgeon, 1st class.

Mr. MATTHEW, Staff Surgeon, 1st class.

Dr. F. REED, Staff Surgeon, 2nd class.

Dr. LAING, Staff Surgeon, 2nd class.

Dr. JEPHSON, Surgeon, 1st Dragoon Guards.

Mr. FOGO, Surgeon, Royal Artillery.

Mr. BAKER, Assistant Surgeon, Scots Fusilier Guards.



## ARMY MEDICAL AND SURGICAL SOCIETY

### Cap. I.

#### OF THE OBJECT AND CONSTITUTION OF THE SOCIETY.

I.—The Medical and Surgical Society of the British Army is instituted for the cultivation of Professional Subjects, and the formation of a closer intercourse amongst the Medical Officers of the Army generally.

II.—The Society to consist of Ordinary, Extraordinary, Honorary, and Corresponding Members.

III.—The Ordinary Members to consist of Medical Officers of the Army or Militia on full or half pay.

IV.—The Extraordinary Members to consist of Medical Officers of the Royal Navy, and of the Hon. the East India Company's Service, on full or half pay, and of Professional Gentlemen who have, at any time, served on the Medical Staff of Her Majesty's forces, Naval or Military.

V.—The Honorary Members to consist of Members of the Profession, British or Foreign, who have eminently distinguished themselves in Medicine, Surgery, or in Sciences connected therewith. The Members of the Honorary Class not to exceed 20.

VI.—The Corresponding Members to consist of British or Foreign Members of the Profession, who are likely to be able to promote the objects of the Society, and are desirous to do so.

VII.—The office bearers of the Society shall be elected from the Ordinary Members, and shall consist of a President, two Vice-Presidents, a Treasurer, and two Honorary Secretaries, who, together with as many other Members as shall make up twenty-one, shall constitute the Council, and shall have the management of the Society's affairs.



In the event of any Member being absent on Foreign Service, the Council have the power to elect a fresh Member.

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Cap. II.

OF THE ELECTION AND ADMISSION OF MEMBERS.

I.—Every Member of the Department, desirous of belonging to the Society, shall signify his intention to one of the Honorary Secretaries in a letter signed by himself, stating his rank and station.

II.—The election of Members, other than ordinary, of every denomination into the Society, shall be by Ballot, and the Ballot shall be taken in such manner as the Council shall, from time to time, determine.

III.—The election of such Members shall take place at any ordinary meeting of the Society, which the Council may appoint, one month's notice at least being given by the Honorary Secretaries.

IV.—Every person elected a Member of the Society, shall have immediate notice sent to him by one of the Honorary Secretaries.

V.—The admission of all Members into the Society, with the time thereof, shall be recorded in the Journal.

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Cap. III.

OF THE WITHDRAWING AND REMOVAL OF MEMBERS

I.—Whenever there shall appear any cause in the opinion of the Council, for the removal of any Member from the Society, a minute shall be made thereof, which shall be submitted to the consideration of the Annual



General Meeting of the Society, and being put to the Ballot and four-fifths of the Members voting for it, (ten at least being present,) the President, or other Member of the Council presiding, shall declare such Member removed from the Society accordingly; of which due notice shall be forwarded to the Member so removed, by one of the Honorary Secretaries.

#### Cap. IV.

##### OF THE CONTRIBUTIONS AND PRIVILEGES OF MEMBERS.

I.—Ordinary Members shall contribute Ten Shillings annually in advance to the Funds of the Society, shall be entitled to a copy of the Society's Journal without payment, and have the right of voting upon all questions raised.

II.—The Extraordinary and Honorary Members shall have the privilege of attending the ordinary meetings of the Society, but have no right to vote upon any question brought before the meeting, and shall be exempted from all payments, but will not be considered entitled to a copy of the Society's Journal without payment.

III.—The Corresponding Members shall not be entitled to a copy of the Society's Journal unless their communications shall have been considered worthy of publication in it, but any communications which may be received from them, shall, from time to time, be laid before the Council, to be read if thought desirable, by one of the Honorary Secretaries, at any ordinary meeting of the Society.

V.—Every Member of the Society, whose subscription shall be more than six months in arrear, if abroad; or more than two months in arrear if in the United Kingdom, shall be written to by one of the Honorary Secretaries, and after this notice, he shall not enjoy any of the privileges of a Member, until such Subscription be paid.

VI.—If the arrears shall not be paid on or before the succeeding Annual General Meeting, after the Member



has been communicated with by the Honorary Secretary, and no satisfactory reason assigned to the Council for such non-payment, such member shall cease to belong to the Society

Cap. V.

OF THE ELECTION OF OFFICERS AND COUNCIL.

I.—Every Ordinary Member of the Society resident in the United Kingdom shall be summoned to the Annual Meeting, at least one month previous to the day on which it shall take place, by a letter signed by one of the Honorary Secretaries.

II.—The whole of the Members of the Council shall be elected annually by Ballot, but no Member shall be eligible for the offices of President or Vice-President for more than one year in succession, neither shall any Member be eligible for the offices of Treasurer, or Honorary Secretary for more than two years in succession: unless recommended for re-election by a majority of not less than two-thirds of the Council, ascertained by Ballot in a meeting of Council specially summoned for the consideration of the subject of office bearers of the Society.

III.—One half of the Members of the Council, who are not officers of the Society, and who have attended the fewest meetings of Council, shall retire by rotation annually, and be replaced by an equal number of other Members chosen from the Society at large; due regard being had in the selection of such new Members, that they are likely to be stationed during the ensuing year in London, or the neighbouring districts, so as to be available for the office of Members of Council.

IV.—Any Member who has thus lost his seat in the Council, shall, nevertheless, continue his eligibility for any office in the Society: in like manner, the Treasurer or either of the Honorary Secretaries who may retire, shall be deemed eligible for a seat in the Council for the ensuing year.

V.—Balloting Lists recommended by the Council, shall be laid on the Society's Table for the use of the Members, one month previous to the day of election, and



sent to each member of the Society resident in the United Kingdom, with the circular Summons for the Annual General Meeting.

VI.—The Chair shall be taken at the Annual General Meeting at such time as shall be fixed upon by the Council, which time shall be inserted in the circular Summons, and the Ballot shall continue open for not less than one hour.

VII.—The President, or Member Presiding in his stead, shall appoint from the Members present, two or more scrutineers to superintend the ballot in its progress, and when it is closed, to examine the Lists, and report the results to the Meeting.

VIII.—Each Member voting, shall deliver his List, folded up, to the President, or Member presiding in his stead, and the name of each Member who shall so deliver in his List, shall be noted by one of the Secretaries.

IX.—In case any Member shall be unable to attend personally at the Annual General Meeting, and shall nevertheless be desirous of exercising his privilege of voting: he must return his List so filled up, sealed, but not signed, and enclosed under cover to the President on or before the day of election in another sealed cover with his name inscribed thereon: the enclosed List with the seal unbroken is to be deposited by the President in the Balloting Box, on the day of election.

X.—If any Member has an equal number of votes for an office in the Society, or place in the Council: the Member to be finally elected, shall be determined by lot, and if any doubt or difficulty arise during the election, it shall be determined by the majority of the Council then present.

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## Cap. VI.

### OF THE PRESIDENT AND VICE-PRESIDENTS.

I.—The function or duty of the President, shall be to preside at all the meetings, and to regulate all the proceedings of the Society, and the Council; to state points, and



request replies in reference to them, both in the affirmative and negative, in order to elicit the sense and intention of the meeting, to maintain order in the proceedings, and see to the execution of the provisions of the "Rules and Regulations" of the Society. He shall, after the minutes of each meetings are read over, with the approbation of the Members present, sign the same as a voucher for their accuracy; and shall direct the summoning of all extraordinary meetings of the Society.

II.—In the absence of the President, the Vice-Presidents in rotation, or in their absence, a Member chosen by the Members present, shall take the chair, and perform all such business as the President when present, is empowered to do, by the Rules and Regulations of the Society.

## Cap. VII.

### OF THE TREASURER.

I.—The Treasurer shall receive for the use of the Society, all sums of money due, or payable to the Society, and out of such money, shall pay and disburse all sums which may be due from, or payable by the Society; and shall keep particular account of all such receipts and payments, in the way which may seem most proper to the Council.

II.—He shall not pay any sum of money on account of the Society, without the previous sanction of the Council.

III.—All sums of money in the hands of the Treasurer, which shall not be immediately required for the use of the Society, shall be deposited in the name of the "Treasurer of the Society," at one of the principal Army Agents, as shall be approved of and directed by the Council.

IV.—The Treasurer shall keep a book of printed check receipts for annual contributions; every receipt shall be signed by him, and be filled up with the name of the member paying, the sum paid, and the time for which the contribution is paid.



V.—The accounts of the Treasurer shall be audited annually by the two Auditors of the Society, who shall not be Members of the Council, but shall be appointed with the consent of the majority of the Members present, given by Ballot if demanded, at either of the two meetings next preceding the Annual General Meeting.

VI.—The Auditors shall make their report in writing to the Society, upon the day of the said Annual General Meeting, stating not only the Balance in the Treasurer's hands, but also the general state of the Funds of the Society.

### Cap. VIII.

#### OF THE HONORARY SECRETARIES.

I.—The Honorary Secretaries shall have the superintendence and management of the correspondence of the Society, and Council, and shall keep a book of the registered members of the Society.

II.—One of the Honorary Secretaries shall attend all meetings of the Society and Council, where, when the chair has been taken, he shall read the minutes, orders, and entries of the preceding meeting, and shall afterwards take minutes of the business and orders of the present meeting in a rough minute book, to be afterwards entered in the proper book, and, at the meeting of the Society, shall mention the presents made at the last meeting; shall give notice of any fresh members who have joined the Society, and shall read the letters sent, and papers presented to the Society in the order of time in which they were received: unless the President shall otherwise direct.

III.—It shall be the duty of the Honorary Secretaries to have a complete copy of the Laws, and a list of the Members kept in readiness for immediate reference at any meeting of the Society and Council.

IV.—They shall frame an annual report of the state of the Society for the use of the Council at its first meeting in May, also an account of the periodical business that is to come before the Council and Society.



V.—The Secretaries shall be ex-officio Members of all Committees, and their names shall appear on all printed papers, as a guarantee of authenticity.

## Cap. IX.

### OF THE COUNCIL.

I.—The Council shall have the management of the affairs of the Society, and shall appoint such servants as they may deem necessary, shall fix their duty, and remuneration, and suspend or remove them when they see occasion.

II.—The Council shall meet on the first Saturday in every month at two o'clock p.m. (or oftener should they see occasion,) five to form a quorum, and the senior member present to take the chair. Due notice of each meeting shall be sent to every member of the Council.

III.—Special meetings of the Council may be held on the requisition of the President, or any three Members, one week's notice at least being given.

IV.—All questions in the Council shall be determined by Vote, or by Ballot, if demanded; and in case of an equality of votes, the President shall have a second or casting vote.

V.—The proceedings of the Council shall be recorded in a book to be kept for that purpose.

VI.—The Council shall appoint a "Printing Committee" to determine upon the propriety of publishing such papers as may have been read before the Society, or any other communications which may have been received.

VII.—The "Printing Committee" of the Society shall consist of three Members of Council, they shall be considered as referees, and shall have the sole arrangement of the publication of the Society's Journal.

VIII.—An "Examining Committee" shall be appointed at each monthly meeting of Council, consisting of two



ordinary Members of Council, and one Honorary Secretary, to be selected if possible by rotation; to whom all papers and communications from Members shall be submitted at least one week prior to the ordinary meeting of the Society, at which such paper is intended to be read.

IX.—All papers read before the Society, shall be considered the property of the Society, with a view to publication in the Medical Journals, but, should the author of any paper read before the Society, desire its publication in the Society's Journal, such paper shall not be taken out of the possession of the Secretaries for the purpose of alteration, until the question as to its publication be decided by the "Printing Committee."

X.—No Member of Council shall vote, or be present when the propriety of publishing any of his own papers is discussed.

XI.—The Council shall exercise such other powers and authorities, and from time to time make such regulations, and issue such orders, as shall appear to them conducive to the good management of the Society, and the proper government of its concerns, subject to be confirmed or annulled at the Annual General Meeting.

XII.—All unclaimed papers not selected for publication, and the original manuscripts of those published, shall be considered the property of the Society.

## Cap. X.

### OF THE SOCIETY'S REPORTS AND JOURNAL.

I.—An abstract Report of each of the ordinary meetings of the Society, shall be forwarded to the principal Medical periodicals in London, by one of the Honorary Secretaries as soon as possible after such meeting has occurred, also a notification of the succeeding meeting shall be forwarded to the same medical periodicals, stating the name of the author of the paper, and the subject proposed to be read.

II.—A Journal shall, if possible, be published half-yearly, which will include such papers read at the meetings of



the Society as are approved of, and be designated the "Journal of the Army Medical and Surgical Society."

III.—The Rules and Regulations of the Society shall be printed, and circulated gratuitously amongst the registered Members.

IV.—The Council shall be empowered to present in the name of the Society, copies of the Journal to individuals, and to such scientific bodies as they may think proper.

#### Cap. XI.

#### OF THE ORDINARY, ANNUAL, GENERAL, AND SPECIAL, GENERAL MEETINGS.

I.—The ordinary meetings of the Society shall be held on the first Saturday of each month at half-past seven o'clock in the evening, with the exception of the months of July, August, and September.

II.—Each Member of the Society shall have the privilege of introducing two strangers at any of the ordinary meetings after inserting their names in the visitors book, which shall be delivered to the President, or person acting in his stead, who shall subsequently invite the visitors to take part in the discussion of the evening.

III.—The business of the Society at the ordinary meetings shall be to read letters, reports, and other papers, on medicine, surgery, or any of the branches of science connected therewith, and to converse upon professional subjects.

IV.—At the ordinary meetings of the Society, nothing relating to its laws, or management shall be brought forward.

V.—The papers proposed to be read at the next meeting of the Society shall be publicly announced by the Honorary Secretary, and be suspended subsequently in the Society's rooms, also, notices of the Ordinary, Special General, and Annual General Meetings of the Society, shall, from time to time, be forwarded to the Secretaries of the Army and



Navy, and Junior United Service clubs, for the purpose of being placed on the table of the said clubs for the information of the medical members.

VI.—At Ordinary Meetings, five shall form a quorum, but ten shall be necessary for the election of members.

VII.—Additional Ordinary Meetings may be held during the season, when, from the pressure of valuable communications, the Council may think them necessary.

VIII.—The Annual General Meeting of the Society for the election of the Officers, and other members of the Council, for receiving the Auditors report, and deciding such questions as may be referred to it, shall be held annually in London, on the day, (not being Sunday) following the annual meeting of the Friendly and Benevolent Societies.

IX.—The President and Council shall, at any time, call a Special General Meeting of the Society, when it seems to them necessary, or upon the requisition of twelve Ordinary members of the Society.

X.—Whenever a Special General Meeting is announced, the Honorary Secretary shall give at least fourteen days notice to every member of the Society resident in London or the adjoining stations, stating the period of the meeting, and the business upon which it is summoned, and no business shall be entered upon at such meeting, except that which has been so notified.

XI.—All new proposed Rules and Regulations, and all alterations of old Rules, shall be suspended in the Society's Room for the inspection of the members from the time of issuing the summonses for the Annual General Meeting, at which it is intended to submit such changes for confirmation by two-thirds of the members present.

XII.—The members of the Society, at any Station where there are British Troops, may, acting under the general Rules of the Society, hold branch meetings, the proceedings of which are to be forwarded to the Honorary Secretaries, to be re-read at any ordinary meeting of the General Society in London, if thought advisable.

XIII.—Where branch Societies cannot be held for want of members, special communications are invited from medical Officers, which should be forwarded to the



Honorary Secretaries, through the principal medical Officer of the nearest Station, for the purpose of being read at any one of the Ordinary meetings of the Society in London.

## Cap. XII.

### OF THE SOCIETY'S PROPERTY.

I.—The whole of the Society's Property and effects of what kind soever, shall be under the direction, and management of the Council, subject to the instructions and control of General Meetings of the Society, and the Council shall not dispose of any property or effects of the Society, without the sanction of a special General Meeting of the Society, or of the Annual General Meeting, due notice having been given of the business to be then taken into consideration.

## Cap. XIII.

### OF DONATIONS TO THE SOCIETY.

I.—The name of every person who shall present books, money, or any other property to the Society, shall be entered on the minutes, with the mention of the gift; it shall be announced at an Ordinary Meeting, or the Annual General Meeting of the Society, and inserted in the first volume of the Society's Journal thereafter published.

II.—Books presented to the Society, shall have the Donor's name inserted in them.

PRINTED BY NICHOLS AND SON, CHANDOS STREET, STRAND.



18

THE

PROCEEDINGS OF THE

ANNUAL MEETING OF THE

AMERICAN SOCIETY OF

ETHNOLOGISTS

Held at the

Hotel de Ville, Paris, France,

July 1st to 5th, 1891.

Published by the

AMERICAN SOCIETY OF ETHNOLOGISTS,

NEW YORK.

1891.

OF THE

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NEW YORK.

1891.

OF THE



*W. 2*

*J. Longmore  
D. F. S.*

THE  
ACCLIMATION OF EUROPEAN TROOPS  
FOR  
SERVICE IN INDIA,  
AND  
THE ORGANIZATION THERE MOST SUITED TO  
SECURE EFFICIENCY IN THE FIELD.

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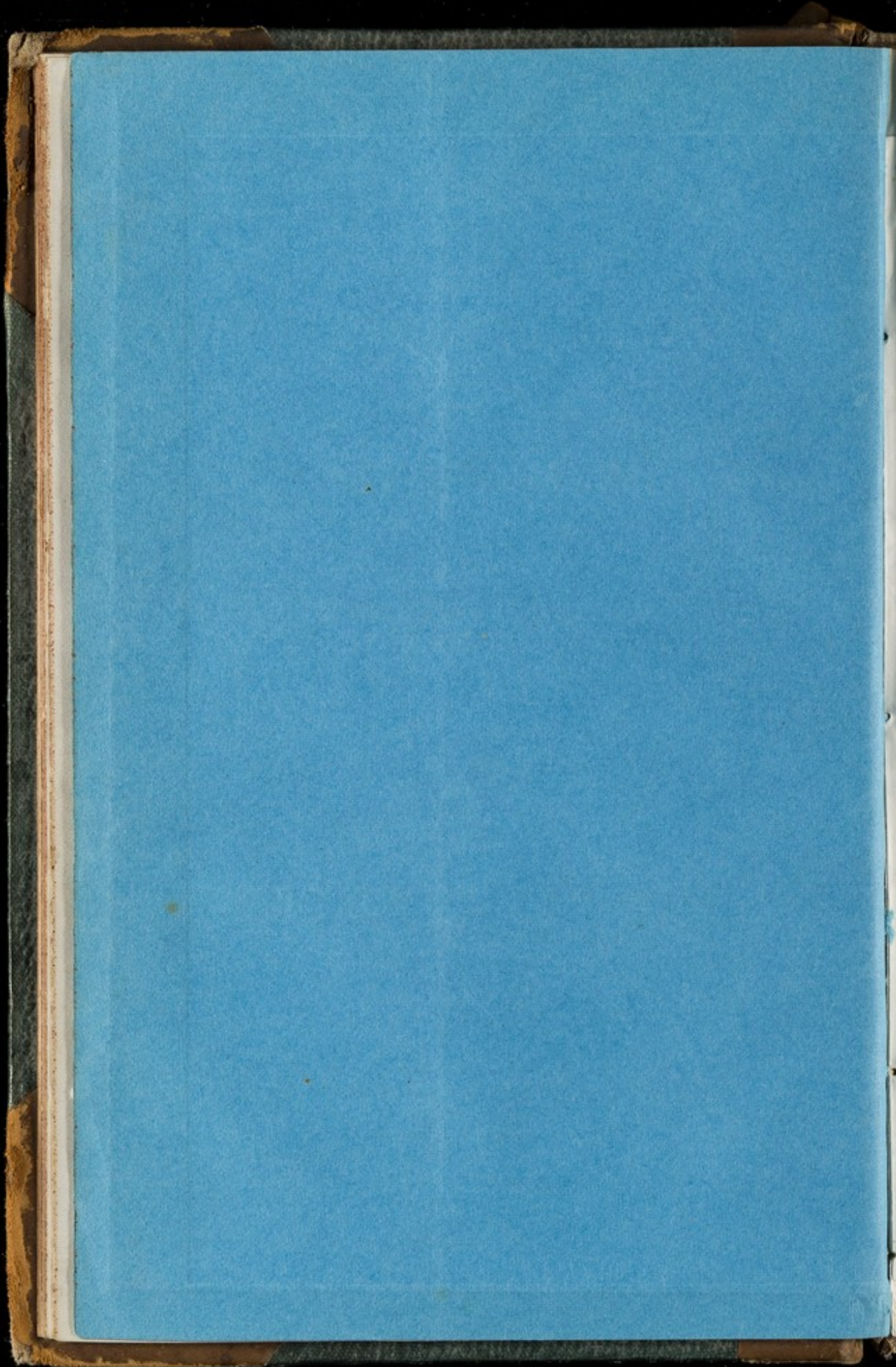
BY  
JAMES BIRD, ESQ., M.D., F.R.C.P.,  
AND LATE PHYSICIAN GENERAL BOMBAY ARMY.

---

*From the JOURNAL of the UNITED SERVICE INSTITUTION, vol. iii.*

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Fernacres Lodge.  
Gerrards Cross - Bucks  
3<sup>d</sup>. September 1862

My dear Sir

While the promise I made  
is yet fresh in my memory -  
I do myself the pleasure of  
reminding you of the two Proposals  
I spoke of. I shall be glad

if they may be of sufficient interest for you to read them. I would not as soon as possible - How arduous the subject of rectification is a difficult one - and often misinterpreted, I think - in regard to statistical results, which are rather from compounded influences than the simple abstract use of charts.

Regarding the translation I shall, as you suggested, get

Deputy Inspector of Hospitals  
Prof. F. Langens  
Chatham -

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*[Faint, illegible handwriting visible through the paper, likely bleed-through from the reverse side.]*



AMONG the mountain ranges of the western ghats of India, the Neilgherries, and elevated spurs of the lofty Himalayan chain, districts and climates, suitable for the healthy residence and vigorous existence of the European race, have of late years been eagerly explored, and as rapidly made the settlements of English invalid officials. The best known and most frequented of these hill stations are Aboo and Mahabaleshwar on the west, for the Bombay presidency; Ootakamund and the other Neilgherry stations for Madras; Darjeeling for Calcutta and Bengal; Simla, Nynce Tal, Landour, and Mussoorie, for Bengal and the north-west provinces; and Murree and Dalhousie for the Punjaub. The experience of thirty years has established that the climate of these stations is congenial to the feelings and health of Englishmen, and that, as permanent residences, they are suitable for our population, in so far as their limited extent of territory permits; and that the out-door labours of settlers would not, for eight months of the year at least, be interrupted by the excessive rain-fall, which, for successive days of the four months of the Indian rainy season, is found amounting to 10 or 24 inches of rain daily. Along with the introduction, therefore, of the railway system into India, flattering schemes for the colonization of these hill stations, and the cantonment there of a large English force, have been perseveringly and glowingly set before the Government and the public, as encouragement for both to liberally subscribe their money for the practical completion of such schemes. Some of these recommendations, however, more particularly their military occupation as acclimating stations for troops, have been made without due knowledge and consideration of the physiological changes effected in the human body, under change of climate and locality; or of the hygienic conditions under which such changes, and the acclimation of Europeans, with the results of their efficiency for service in hot climates, can be most effectually obtained. In fact, the elevated table-lands, or plateaux, above which several of the hill stations rise, such as Dapoorie, on the same high plain as Poona, or 1,900 feet above the sea-level, have been somewhat incongruously spoken of as hill stations, and recommended, in the same breath with the last, for extended military occupation. But the conditions of climate peculiar to the former, and the organic physiological changes effected by residence there, which form individual constitutions suitable for hot climates, are altogether different from those experienced at higher elevations of from 4,000 to 7,000 feet; where elevation is accompanied by the same diminution of temperature as met with in temperate latitudes, or in this country, but from which European soldiers, after years



of healthy residence, would, on descending to the lower plains for military service, suffer nearly as much as if under direct and immediate transference from temperate to equatorial latitudes; where, as already recommended in my former lectures, the best means of assimilating the raw soldier's constitution to new employment and climate will be to remove, as far as possible, all local and topographical causes of unhealthiness; and to neutralise, at the same time, the hurtful agencies of extreme and variable temperature, or excessive dryness and humidity, by well-regulated systems of diet, clothing, exercise, and amusement, along with the healthy sites of the soldiers' tents, barracks, huts, and hospitals.

Certain increased ratios of sickness and mortality among masses seem inseparably associated with certain degrees of latitude; the average of human life, under equal circumstances, being shorter in proportion as we are near the equator, and lengthening gradually as we approach the pole. Such higher or lower averages seem mainly dependent, as a whole, on higher or lesser degrees of temperature and moisture connected with particular latitudes, and are inversely as the degrees of latitude. They are also relatively greater or less, in the inverse ratio of elevation of site and locality, when the diet, clothing, and social and moral habits of individuals are alike and placed under equally sanitary conditions of a dry soil, good drainage, and an open country, more exposed to sea than land breezes. The conservative influence of insular maritime climates is greater than continental sites in the same degrees of latitude, and is probably one reason why the per-centage of mortality for age in England is less than that of France. In the southern provinces of the latter country, where the climate is warmer, the average mortality of the population is a tenth greater than in the northern provinces, or 1 in 33 to 1 in 44; and yet it is not from the last, but from the former, that troops for service in Algeria are taken, as their constitutions, after a few years' residence there, are found better able to resist the morbid influences of a hot climate, and the disturbed physiological actions of constitution incident to all cases of transference from different climates and localities. To avoid, therefore, the probability of any great increase of the ratio of sickness and mortality, among troops under transference from cold to hot climates and localities, it is desirable that the transference should be effected at that season of the year when the conditions of climate and country to which troops will be exposed are found to vary least from those conditions characteristic of the climate and locality they have just left. In selecting, then, particular elevated sites and localities for military occupation in hot climates, the question is not one merely of the highest elevation, possessing climatic conditions of the temperate zone, and the consequently diminished chance of engendered malarious influence and sickness; but at what altitudes and in what localities of India, and other hot climates, can large bodies of troops be best cantoned and habituated to varied and elevated temperature; and to the moisture of these climates, so as to keep down high ratios of sickness and mortality among soldiers, and render them most efficient for service in the field. If the question was only one of colonization or permanent occupation, without chances of removal to service and fatigue in a warmer atmosphere, the choice, without any risk of failure or disappointment in result, might be given to the greatly elevated and colder hill climates of



India, met with at the height of between 6,000 to 8,000 feet. But, on the subject of military occupation and the cantonment of troops, it plainly resolves itself into conclusions from facts, as to the final results for armies best prepared for field service; or, in other words, what climates and localities of India are most calculated to effect that sanitary condition of European military masses, so as to render them least susceptible of morbid impressions, during exposure to heat and other causes of disease incident to field-service in that country: where, out of any given number of men, entering on such service, and accustomed to a hot climate, there will be the greatest amount of efficiency in the field, under a decreasing ratio of sickness and mortality. The answer to these queries, and their solution, mainly depends on a right appreciation of what essentially constitutes for strangers in a new climate, and under its modifying climatic agencies, that altered constitutional condition which ends in health for the new comer, with the possibility of living in and resisting the diseases of the country nearly as well as those who are indigenous to it. These modifying atmospheric agencies are temperature, density, moisture, and electricity; the nature and composition of the soil and locality, with its extent of easting, and proportion of continent or otherwise; which, continually acting on the body, effect in due time a special modification and interchange of organic functions, which adapt individuals and masses to the new conditions of their existence.

Some, from having confounded together two orders of agencies, the atmospheric and endemic or miasmatic causes of disease, absolutely deny the possibility of acclimating Europeans in hot climates. Mons. Baudin in France, Sir Alexander Tulloch and Mr. Martin in this country, incline to this view:—which is, however, opposed by the enlarged experience and well-considered opinions of Dr. M. Levy, MM. Celle, Perier, and Aubert Roche in France, and of many other experienced army medical officers in this country. Dr. Levy says, "According to the investigations of Sir Alexander Tulloch, it has been advanced that prolonged sojourn, far from promoting acclimation, increases the chances of mortality; and statistics, always pliant and flexible for every kind of paradox, have crowded their group of figures around this opinion. Soundly-observed facts refute it however. From 1,220 military who died in Algeria, and taken at random, three-fourths had not exceeded a residence of 17 months. We have also noticed the progressively numerical decrease of men discharged: for, out of 1,575 dysenteric cases that came under observation during 10 years in Africa, 338 belong to the first year, 235 the second, 150 the third, 86 the fifth, 35 the seventh, 17 the eighth, and 2 the last two years."\*

These preliminary observations on the subject of localizing and acclimating European troops on hill stations in India bring me to the consideration of the three following heads of this lecture:—

1st. If acclimation be possible, what is the nature of that physiological adaptation of European constitutions for hot climates that assimilates them to the same standard of organic action incident to the organism of the indigenous inhabitants, and confers on them a nearly like immunity from certain diseases?

\* *Traité d'Hygiène Publique et Privée*; par Michel Levy, *Medecin principal d'Armée*, &c. tome i. p. 568.



2nd. The elevation and condition of the stations and climates of India most desirable for placing European soldiers beyond the range of aggravated attacks of fever and bowel complaint, and most suitable for producing that kind of constitutional adaptation by which they may be rendered most efficient for field-service.

3rd. What practical lessons may be drawn from the consideration of these questions, and what organisation of European troops in India would secure most efficiency on service, and with greatest good to the State?

I shall endeavour to treat these points in a comprehensive but brief manner, still sufficient, I hope, to convey to my hearers definite ideas of a difficult subject; obscured as it has been, in some measure, by incongruous elements of morbid causation, such as yearly decrement of constitutional power by age, augmented by miasmatic influences of locality, not having been separated from atmospheric causes by those who obtained statistical figures and results, to prove that in hot climates there is no acclimation. But, if acclimation be possible, what are the proofs of it? I have already quoted the opinion of the well-known French army physician Dr. Levy, that according to his experience the contrary opinion of this is a paradox. Indeed, it is true only in this way, that the law of yearly increasing mortality from five years of age onwards, and which, for Europeans, prevails with the smallest ratio of mortality in temperate latitudes, when exaggerated by transference to equatorial latitudes, and other elements of increased morbid causation, not ameliorated by suitable sanitary arrangements for climate and locality, gives a large and continuously increasing ratio of physical degradation and mortality. The operation of this law, among masses of men, gives the least statistical ratio per 1000 for the civil population of England, or a mean of 8.45; while in Prussia, France, and other continental states, it increases to 10 and 11.25 respectively. But the relatively mean ratio of mortality under this law, when sought for among the soldiers and officers of the English army at home, is 14.52,\* and among those of the French army 15.10;† showing that the soldiers' separation from the influences of his natal place, climate, and association, increases on the whole his physical degeneration—even under home residence and climate. The mean ratios of mortality among the French military at home, and of English troops in Ireland, under this law, compared with the respective means for the troops of both nations under hot climates, are to be seen in Table III. The home ratios, having been calculated for years when the sanitary condition of soldiers was little attended to, are higher than those obtained from later years. What wonder, then, that under transference to equatorial latitudes, and augmented sources of unhealthiness unremoved, and not ameliorated by suitable sanitary provisions and arrangement, statistical figures and results should

\* In the tables handed in by Sir Alexander Tulloch, in support of his evidence before the commissioners appointed to inquire into the organisation of the Indian army, the mean of cavalry and infantry is given at 15.52. The other table there, corresponding with No. VI. I have taken from Mr. Marshall.

† The mortality of Europeans under military life, and in increasing ratio according to residence and proximity to the 1st degree of equatorial latitude, is increased by advance of age, transition from native climates, transference to tropical latitudes, unremoved sources of endemic disease, and bad sanitary arrangements for soldiers in respect of their diet, barracks, clothing, and exercises.



have been obtained to speak so loudly against the possibility of constitutional acclimation, or adaptation of the nervous, circulating, and excretory functions necessary to contend against the changed conditions of life in a new climate. We may at once learn, by a reference to Table VII., how this law of yearly-increasing mortality for age, per 1000 of the civil population, operates in this country; and by Table VI. we may see how, by the same law, an exaggerated ratio of mortality takes place among the military on transference to our colonies. In latitudes north of the equator it is least in the Ionian Islands, being 19·8;\* but in southern latitudes, under the rather hot climate of the Cape of Good Hope, and where but few sources of miasmata exist, it falls to 17·6, being only 3·8 above the mean ratio for this country.

"Change of climate," says Dr. Levy, "is to be born to a new life. Some changes become necessary in the vicarious or alternate functional action of the principal organs, in the regimen, and habits moral and social; but so complete ought these changes to be that they may be effected without necessarily producing either disease or death. The gift of elasticity of our fibres, the gift of extent of our functional oscillations, is conferred on us for accommodating ourselves to new influences collectively, in order to plant ourselves in every place where humanity is represented by some one of its numerous tribes. But this is under the condition of conforming to things necessary for the transition, and of combating, by attention to hygienic modifiers, the assaults of climate and irregularities of organic action. That the statistical mortality of Europeans in hot climates need not be a subject of exaggerated fears, we repeat that it proves less the radical unhealthiness of certain climates than the deleterious conditions, but correctible, of their topography, such as the existence of marshes, and vast masses of organic matter. It proves above all the baneful consequences of neglecting the laws of hygiene."

The operation of age, in diminishing constitutional vigour, and thereby increasing the yearly ratio of mortality among bodies of men, is sensibly felt and appreciable, under all conditions and in every quarter of the globe. The statistical results, therefore, of this operative law necessarily increase, in proportion as those subject to it are exposed to additional causes of morbid causation in hot climates, and such as have been mentioned; but, though we cannot altogether bring down the mean ratios of mortality of hot climates to the standard average of temperate ones, we have still within our power the removal of certain endemic sources of disease in localities, and to so train the changing organic functions of the body into a healthy state, under altered conditions of elevated temperature, for purposes of assimilating a majority of European constitutions to hot climates, and with results of having mean ratios of sickness and mortality among troops, not greatly in excess of those incident to our own country and like temperate zones. If this were not the case young soldiers in India, under exposure to elevated temperature and fatigue, would be quite as healthy as the old or seasoned ones; while the very reverse of such result is found to be the experienced opinion of old military and medical officers. The acclimation so acquired, and by which old soldiers

\* In the second of Sir Alexander Tulloch's tables before quoted this is given at 16·4.



can outwork the younger ones on a campaign, is not mere experience gained by residence; but partially a physiological adaptation of constitution to new conditions of life, with improved physical qualities, for accommodating itself, under fatigue, to those conditions.

The adaptation to the changed conditions of hot climates, independent of miasmatic sources of disease, must be gradual and progressive for unacclimated masses of strangers, and imposes on them the necessity of shorter or longer sojourn in intermediate regions, with proper attention to moderate eating and drinking, selection of season for landing in the new climate most akin to that which they had just left, and, after arrival, fixing on habitations and localities free from miasmata, protected from land winds, and under the salutary influence of those from the sea; together with the resolute adoption of suitable diet, clothing, and exercise. Such care and attention become necessary, in order that certain organic functional actions, in more elevated temperature, may be reduced in force, and so regulated as to be brought into vicarious healthy action in place of others, and to aid some, lessened in power and activity.

At page 31 of the Appendix to Minutes of Evidence taken before the Commissioners appointed to inquire into the Organization of the Indian Army, Returns 34 and 35 are given, in illustration of the comparative beneficial results of transference of regiments to India, after sojourn in the intermediate climates of Australia or the Cape, and of direct transference from England. While the result of these Returns makes questionable the propriety of transferring troops from our Australian colonies, they bring out the benefit of doing so after a sojourn at the Cape. The mortality of five regiments sent from the Cape to India, after the first year of service, was 4.8 to 11.0 among eight regiments sent direct from England; and if the ratio of mortality for three additional regiments at the Cape be added to the former ratio, we obtain the comparative beneficial results of transference from the Cape and from England as 7.21 per cent. to 11 per cent. of their strength. Nothing can be more conclusive than this of the possibility and benefits of graduated acclimation to elevated temperature, apart from the miasmatic influence of locality. The superiority of residence at the Cape over the graduated influence of a sea voyage, is thus brought out. Acclimation too of troops in India, under suitable sanitary arrangements, as not only practicable, but an obvious result among old soldiers, when they have become seasoned, is further substantiated by many valuable facts brought forward in Mr. Willoughby's able and consistent evidence, given at p. 267 of the Commissioners' Report, as well as by much that is admitted in the evidence of the medical witnesses; for at page 171 of the Report, and in reply to Major-General Hancock's question, "Does not a greater mortality prevail among young officers and soldiers than among those who have been eight, ten, or twelve years in India?" Mr. Martin answers, "Yes, always; the mortality is greater among the young, the improvident, and, if I may so call it, the unseasoned. I am afraid to say anything which should lead to the conclusion that there is such a thing as acclimation; but that kind of accommodation of the habit and constitution occurs in every country in the world, not in India alone. The army of Napoleon broke ground from Boulogne in 1805, he marched 400 French leagues to the battle of



Austerlitz, they were all old soldiers, they were exercised, no room was left for idleness, and there were hardly any sick on the roads. When he went again, in 1809, to the battle of Wagram, the roads were lined with youths who perished." Is not this corroborative of the opinion I hold, in common with many celebrated physicians and physiologists, "that there is virtually a physiological adaptation of constitution to new conditions of life, with improved physical qualities?" This, too, is an adaptation which not only prepares them for greater fatigues during a campaign, but exempts them from attacks of many severe diseases incident to marching in hot climates, particularly cholera and sun-stroke. Regarding the exemption from the latter enjoyed by old soldiers, Sir Robert Vivian, in his evidence (p. 137 of the Report), adduces, in support of his opinion that Europeans can be seasoned, the superintending surgeon, Dr. Arnott's, medical experience, "that it was a somewhat remarkable fact of two European regiments engaged in the affair before Kooneh, on the 7th May, 1858, the right wing of H.M. 71st Regt., about 425 strong, had twenty men attacked with sun-stroke, of whom seven died, while the portion of the 3d Bombay Europeans, about 330 strong, had not only no casualty from, but no man attacked by, this disease, though both corps were equally exposed to the same causes of disease, and under circumstances apparently precisely similar. The 3d Europeans had an average service of three years in India, the 71st arrived in Bombay the preceding February, 1858.

Acclimation, then, in hot climates being admitted as a physiological and practical result, I come to the second part of the inquiry, "What should be the elevation and condition of stations and climates in India most suitable for producing that kind of constitutional adaptation, by which men may be made most efficient for field service?" Not certainly in the more elevated mountain climates of India, within the range of 4,000 to 7,000 feet, where diminution of temperature produces climates akin to those of the temperate zone, and associated with kindred organic functional actions of the body as are met with in those; except that calorification and respiration are less energetic from the diminished density and oxygenation of the air, while the processes of sanguification and nutrition are more venous and incomplete, with a greater concentration of blood in both the lungs and digestive apparatus. Their limited extent, too, may scarcely admit of large bodies of soldiers being acclimated there, and it would be found on experience that, like the indigenous inhabitants of these mountain ranges, Europeans so localised, when brought down from the hills for service in the plains, during the rains and hot weather, would be quite as sickly under the transference, and die in as great relative proportions as men brought direct from England. Elevation of site in equatorial latitudes is accompanied by nearly like climatic conditions as are met with in the temperate zone, and with the same preponderance of certain functional actions of the organism as distinguish its inhabitants and vegetable productions. Special modifications and interchange of these functions would be as necessary, under transference to the elevated temperature and other altered climatic conditions of the plain, as when required for improving the health of Europeans, recently arrived in India.

On this subject Sir George Clerk, in his evidence, page 195 of the Commissioners' Report, says, that locating European troops on the



mountains of India is a false measure; and that with good barracks placed at certain commanding points on the plains of India, they would be more healthy than they are in the West Indies, or in many other colonies. If by commanding points he means, such dry sandy plains as Deesa, or the high plateaus of Poonah, Belgaum, Dharwar, Bangalore, and such like elevated places in the Bombay and Madras presidencies, I entirely concur with this opinion, that with good barracks, and under suitable sanitary arrangements for diet, clothing, and exercise, the ratios of mortality per 1,000 would be so reduced as not to exceed those of temperate climates. In all of these places, much of their healthy character is evidently due to the dryness of the site. At Deesa, in the northern military division of the Bombay presidency, where the elevated temperature sometimes exceeds  $110^{\circ}$  of Fahrenheit, the ratio of mortality, for 10 years, 1847-57, was 21.9 per 1,000; at Poona, 10.7; at Belgaum, in the southern division, 19.; at Bombay, 55.5; and at Bangalore, in the Madras Southern division, 23.8. At Aden, in Arabia, a very dry locality, but hot climate, the ratio per 1,000 is only 25.2. Soldiers cantoned at elevated sites, ranging from 2,000 to 2,500 feet, would be more efficient in the field, and more able to bear up against hardships and exposure on actual service, than those stationed at higher elevations and under conditions of climate more nearly akin to those existing in the temperate zone.

Stations of this kind, where large bodies of troops may be cantoned and acclimatised for Indian service, are everywhere available through the wide extent of the Bombay and Madras presidencies. Selection of moderately elevated sites for Bengal proper, that may be rendered healthy for troops, by means of good drainage and well-constructed barracks, is a matter of more difficulty, from the general flatness of the country: but for the north-west provinces, many eligible and elevated sites may be chosen for locating European troops. Dryness of site, gravelly character of soil, and freedom from masses of organic matter, should be always of the greatest importance in determining a preference of selection for such stations.

Mere elevation of site, without other essential conditions of endemic health, will not necessarily secure low ratios of mortality for troops. Reference to Tables IV. and V. for the ratios of mortality according to elevation of site in the tropical latitudes of the east and west, indicates that at elevations much higher than that of Poona, and other like healthy localities, where, from the nature of the soil and site, endemic sources of malarious disease are allowed to exist, the ratios of mortality per 1,000 will be still found very great, and little or at all below those attainable for troops localised on the plains—facts sufficiently instructive in guiding us to the most necessary sanitary arrangement for soldiers in hot climates, namely, to select, for their barracks or encampment, eligible sites and localities, where there is no accumulation of surface-drainage, and no relative sources of miasmata in the vicinity.

In the Madras presidency, the average ratios of mortality for five years will be found least in the presidency and Mysore divisions of the army, including Bangalore, being respectively 25.5 and 23.5. Within the ten military divisions of that presidency, though there are some very elevated sites, still they are most unhealthy from those endemic sources of disease we have mentioned, and there are many others that



might be yet selected with great advantage for the localisation of troops. Among the elevated but unhealthy sites within this presidency, it will be instructive, on this subject, to notice that in the Mysore division the sites of Seevasamoodrum and Seringapatam, elevated about 2,000 feet, have been found very destructive of European health, while many other localities of the same division, peculiarly productive of fever in former times, have since become perfectly healthy; and in others the very reverse has taken place, shewing the main sources of European unhealthiness are endemic miasmata, and not mere elevated temperature, to which the human organisation adapts itself. Seevasamoodrum is surrounded by water and jungle, and near one of the falls of the Cavary. In other districts of this presidency the ravages of fever and other miasmatic diseases are not stayed, even at an elevation of nearly 5,000 feet, where their endemic sources are allowed to exist. In the Travancore province of the southern division a considerable plateau of table-land, 4,740 feet high, and in the vicinity of Trevandrum, but not yet thoroughly explored, is said to be healthy. Again, in the Salem district of the same division, the table-land of the Shivaroy hills, at a general elevation of 4,600, and but scantily clothed with vegetation, is not beyond fever range after falls of rain. During the dry months they have been found perfectly healthy; but the breaking out of a fatal remittent form of fever among the European residents there, during June, 1824, caused them to be deserted. It is not mere elevation then that we have to look to for European health in India, but to an eligible and perfectly well drained and dry site for European soldiers.

I come now to the third and last point—What practical lessons may be drawn from the consideration of these questions, and what organisation of troops would secure most efficiency on service, and with greatest good to the State? The previous observations made, and the statistical facts adduced in proof, that old and seasoned soldiers are superior in endurance and physical qualities to young unseasoned ones in India, have partly anticipated the solution of these problems. Lord Ellenborough in his evidence, p. 293 of the Commissioners' Report, fully bears out this opinion in the statement that he saw 100 men of the 9th Lancers, who had never seen an enemy, die within the first year of their residence in India. At the utmost strength of cavalry regiments this would be fully a sixth of their strength. The possibility of acclimating troops to mere elevated temperature being possible, and the adaptation of their constitutions being followed on service by lessened ratios of sickness and mortality, form one of the strongest grounds for a considerable organisation of European troops for local service in India; independent of those financial and political considerations, which, for the ultimate safety of our Indian empire, strongly urge on us the necessity of this measure. It is not within the province of this lecture to discuss the financial and political bearings of the question, that there should be a large permanent European force maintained in India, and proportioned to the moveable force of the British Army, always subject to the periodical reliefs from home. The permanent force should be at least two-fifths of the moveable force—say 32,000 to 48,000 men of the regular Army, from among whom, on being relieved to return home, European colonists for hill stations, and recruits for the permanent local force, might be obtained.



In concluding the exposition of the medical questions that have been mooted, we may draw the following inference:—

1st. That the law of constitutional deterioration—greater mortality for age in hot climates, beyond the ratios of like age in temperate ones—can be greatly reduced in operation by removing endemic sources of disease, and by selecting suitable dry localities.

2nd. That in the most insalubrious tropical countries, the selection of good positions, on dry elevated table-lands, suffices often to secure for European troops a perfect sanitary state, nearly equal to the more salubrious regions of the temperate zone: this salubrity varying, however, in a remarkable manner with the geographical latitudes and longitudes of places.

3rd. That the increasing ratios of mortality for hot countries mainly depend on unremoved surface drainage, and the generation of miasmata in places occupied.

4th. That the morbid influence of seasons and climates in producing disease is in direct relation to and dependence on the quality of the soil, the latitude, the longitude, the elevation of the place, its northern or southern exposure, and the national temperaments and races of soldiers who may be there located.

TABLE I.—GENERAL MORTALITY of the ENGLISH ARMY at HOME and ABROAD, from 1819 to 1828.

| Years.    | Effective Strength in the United Kingdom. | Deaths. | Ratio of Deaths per 1,000. | Effective Strength beyond the United Kingdom. | Deaths. | Ratio of Deaths per 1,000. |
|-----------|---|---------|----------------------------|---|---------|----------------------------|
| 1819      | 53,380                                    | 493     | 9                          | 54,992  | 3,755   | 63                         |
| 1820      | 54,527                                    | 740     | 11                         | 50,557  | 2,584   | 57                         |
| 1821      | 37,988                                    | 620     | 16                         | 51,277  | 2,220   | 42                         |
| 1822      | 41,530                                    | 560     | 13                         | 46,709  | 2,692   | 57                         |
| 1823      | 40,786                                    | 566     | 13                         | 48,995  | 1,981   | 40                         |
| 1824      | 42,585                                    | 651     | 15                         | 49,888  | 2,257   | 45                         |
| 1825      | 57,048                                    | 854     | 16                         | 53,755  | 3,849   | 71                         |
| 1826      | 48,826                                    | 1,082   | 22                         | 58,339  | 4,513   | 77                         |
| 1827      | 47,747                                    | 824     | 17                         | 58,440  | 3,713   | 63                         |
| 1828      | 46,193                                    | 828     | 18                         | 58,592  | 2,844   | 47                         |
| Total . . | 470,610                                   |         |                            | 531,534                                       |         |                            |



TABLE II.—MORTALITY of ENGLISH TROOPS from WAR, and under  
TRANSITION to OTHER COLONIES.

| Places.   | Authorities.                   | Period of Observation. | Annual Mortality per 1,000. |
|---|--------------------------------|------------------------|-----------------------------|
| Cape of Good Hope . . . . .                               | Official Reports, 1818 to 1836 | 1818 to 1836           | 15·5                        |
| New Scotia and New Brunswick . . . . .                    | Ditto                          | 1817 to 1836           | 18·                         |
| Malta . . . . .   | Ditto                          | 1817 to 1836           | 18·7                        |
| Canada . . . . .  | Ditto                          | 1817 to 1836           | 20·                         |
| Gibraltar . . . . .                                       | Ditto                          | 1818 to 1836           | 22·1                        |
| Ionian Islands . . . . .                                  | Ditto                          | 1817 to 1836           | 28·3                        |
| Mauritius . . . . .                                       | Ditto                          | 1818 to 1836           | 30·5                        |
| Bermudas . . . . .  | Ditto                          | 1817 to 1836           | 32·3                        |
| St. Helena, 1816 to 1822, and from 1836 to 1837 . . . . . | Ditto                          | .. ..                  | 35·                         |
| Tenasserim Provinces . . . . .                            | Ditto                          | 1827 to 1836           | 50·                         |
| Madras Presidency . . . . .                               | Quetelet                       | 1826 to 1830           | 52·                         |
| Bombay ditto . . . . .                                    | Ditto                          | 1826 to 1830           | 55·                         |
| Bengal ditto . . . . .                                    | Ditto                          | 1826 to 1830           | 63·                         |
| Ceylon . . . . .  | Official Reports               | 1824 to 1836           | 57·2                        |
| Antilles and Guiana. . . . .                              | Ditto                          | 1817 to 1836           | 85·                         |
| Jamaica . . . . .   | Ditto                          | 1817 to 1836           | 143·                        |
| Bahama . . . . .  | Ditto                          | 1817 to 1836           | 200·                        |
| Sierra Leone . . . . .                                    | Ditto                          | 1819 to 1836           | 483·                        |

TABLE III.—COMPARISON of the MAXIMA and MINIMA of MORTALITY of  
FRENCH and ENGLISH TROOPS in TEMPERATE and HOT CLIMATES.

| TEMPERATE CLIMATES.  |                      |               |       | HOT CLIMATES.   |                      |               |       |
|--|----------------------|---------------|-------|---|----------------------|---------------|-------|
| Periods and Departments of Service.                        | Mortality per 1,000. |               |       | Periods and Departments of Service.                                 | Mortality per 1,000. |               |       |
|  | Maxi-<br>mum.        | Mini-<br>mum. | Mean. |   | Maxi-<br>mum.        | Mini-<br>mum. | Mean. |
| FRENCH.<br>Infantry for 6 years in<br>France, 1820 to 1826 | 23                   | 15            | 19·4  | FRENCH.<br>In Algeria 5 years,<br>1838 to 1843                      | 104·                 | 49·           | 76·5  |
| ENGLISH.<br>Troops in Ireland 32<br>years, 1797 to 1828    | 20                   | 10            | 15·   | ENGLISH.<br>In the Antilles and<br>Guiana 19 years,<br>1817 to 1836 | 152·8                | 40·6          | 96·7  |



TABLE IV.—INFLUENCE of ELEVATION and LATITUDE in DIMINISHING the RATIO of MORTALITY among EUROPEANS in HOT CLIMATES.

| Countries and Latitudes.                           | Stations.       | Elevation in feet from the Sea. | Mortality per 1,000. | Remarks.  |
|--|-----------------|---------------------------------|----------------------|---|
| Saint Lucia, 13° 50' north                         | Mount Fortunate | 850                             | 122·                 | Deducting deaths of sick brought there, only 22 |
| Jamaica, 17° to 18° 30'                            | Up Park Camp    | 200                             | 152·8                |   |
|  | Stony Hill      | 1,360                           | 96·                  |   |
|  | Maroon Town     | 2,000                           | 32·                  |   |
| Ceylon, 6° only of north lat.                      | Kandy           | 1,670                           | 60·7                 | In 1849 only 16 per 1,000·                      |
|  | Badula          | 2,100                           | 97·1                 |   |
|  | Nieur-Elia      | 6,200                           | 24·                  |   |
| Mysore   | Bangalore       | 2,400                           | 22·                  |   |
| Neilgherry Hills, in lat. north 11° 10' to 11° 32' | Ootakamund      | 7,116                           | 20·                  |   |

TABLE V.—INFLUENCE OF PROLONGED SOJOURN in INCREASING the MORTALITY of HOT CLIMATES.

| Places.             | Length of Sojourn. | Periods of Age. | Mortality per 1,000. |  |
|---------------------|--------------------|-----------------|----------------------|--|
| Ceylon . . .        | Below 1 year       | —               | 44·                  | The mortality here given is only of one Regiment, the 72nd, of which the effective strength is unknown; but still progressively increasing in a country where malarious influences on mortality is scarcely appreciable. |
|                     | 1 to 2 years       | —               | 48·7                 |  |
|                     | Beyond 2 years     | —               | 49·2                 |  |
| Jamaica . . .       | Below 1 year       | —               | 77·                  |  |
|                     | 1 to 2 years       | —               | 87·                  |  |
|                     | Below 2 years      | —               | 81·                  |  |
|                     | Beyond 2 years     | —               | 93·                  |  |
| Cape of Good Hope . | 3 years            | —               | 8·                   |  |
|                     | 4 ditto            | —               | 13·                  |  |
|                     | 5 ditto            | —               | 12·                  |  |
|                     | 6 ditto            | —               | 16·                  |  |
|                     | 7 ditto            | —               | 13·                  |  |



TABLE VI.: from Mr. MARSHALL.—INFLUENCE of AGE on the ANNUAL MORTALITY of every 1,000 EFFECTIVE MEN among ENGLISH TROOPS at HOME and ABROAD.

| Places of Residence.                       | Mortality per 1,000 from Age. |                      |                      |                      | Mean Mortality per 1,000 at all Ages. |
|--|-------------------------------|----------------------|----------------------|----------------------|---------------------------------------|
|  | From 18 to 25 Years.          | From 25 to 33 Years. | From 33 to 40 Years. | From 40 to 50 Years. |                                       |
| United Kingdom { Cavalry of the Line . . . | 13.9                          | 14.                  | 17.8                 | 26.7                 | 15.3                                  |
| Horse Guards . . .                         | 14.7                          | 11.4                 | 16.3                 | 22.8                 | 14.5                                  |
| Foot Guards . . .                          | 22.3                          | 22.5                 | 17.7                 | 27.5                 | 21.6                                  |
| Gibraltar . . . . .                        | 18.7                          | 28.6                 | 29.5                 | 34.4                 | 22.3                                  |
| Malta . . . . .                            | 13.                           | 23.3                 | 34.                  | 56.7                 | 22.3                                  |
| Ionian Islands . . . . .                   | 12.2                          | 20.1                 | 24.4                 | 24.2                 | 19.8                                  |
| Antilles . . . . .                         | 50.                           | 74.                  | 97.                  | 123.                 | 67.                                   |
| Jamaica . . . . .                          | 70.                           | 107.                 | 131.                 | 128.                 | 91.                                   |
| Bermudas . . . . .                         | 16.5                          | 42.                  | 42.                  | 76.                  | 28.9                                  |
| Canada—Upper and Lower . . .               | 19.7                          | 27.7                 | 37.7                 | 35.7                 | 25.7                                  |
| New Scotia and New Brunswick .             | 14.                           | 22.5                 | 30.8                 | 41.5                 | 20.3                                  |
| Cape of Good Hope . . . . .                | 9.                            | 20.6                 | 29.7                 | 82.                  | 17.6                                  |
| Mauritius . . . . .                        | 20.6                          | 38.                  | 52.7                 | 86.7                 | 34.7                                  |
| Ceylon . . . . .                           | 24.                           | 55.                  | 86.4                 | 126.6                | 48.3                                  |
| Bombay . . . . .                           | 18.2                          | 34.6                 | 46.8                 | 71.1                 | 33.1                                  |
| Madras . . . . .                           | 26.                           | 59.3                 | 70.7                 | 86.5                 | 52.2                                  |
| Bengal . . . . .                           | 23.8                          | 50.3                 | 50.6                 | 83.3                 | 44.5                                  |

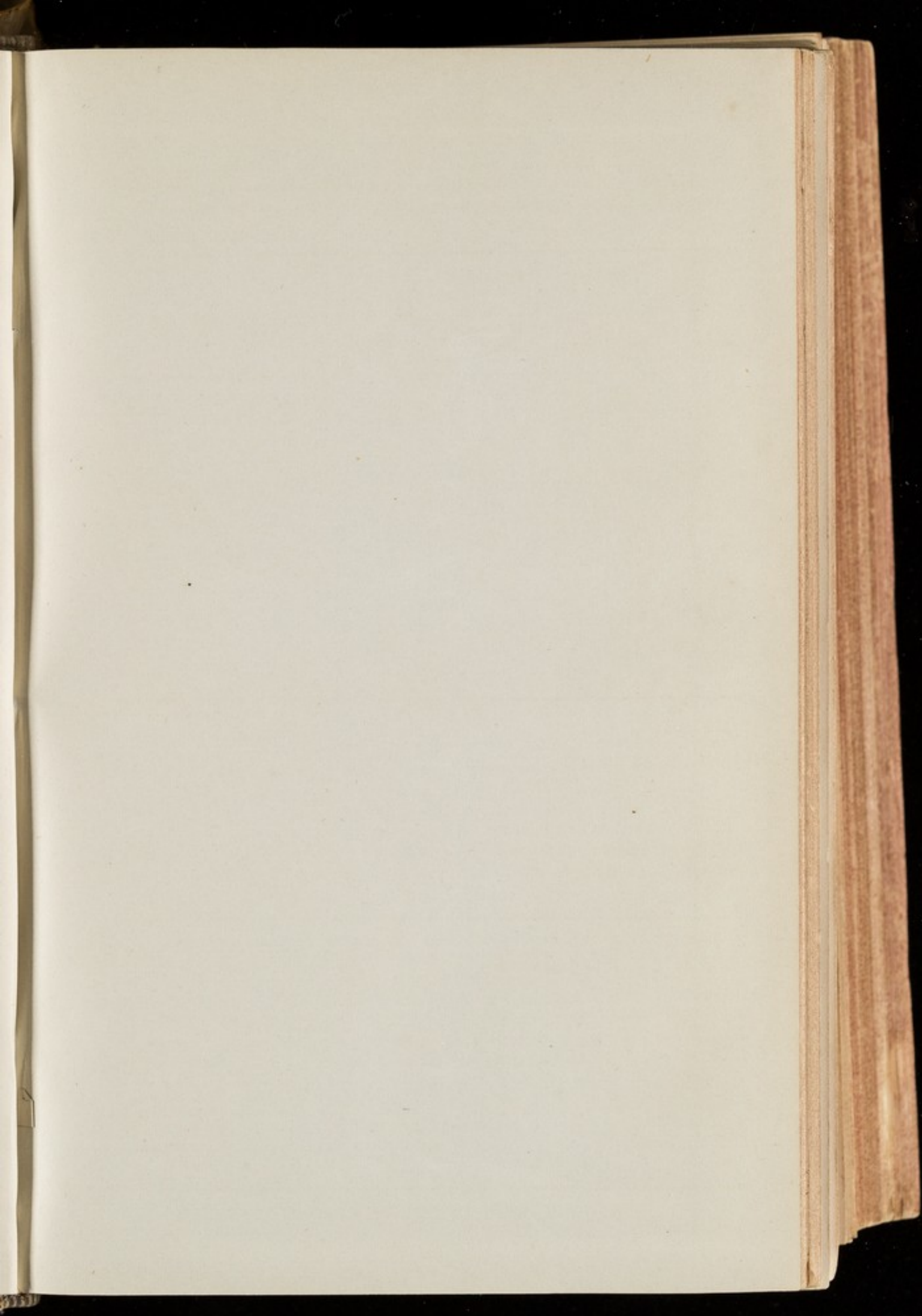
TABLE VII.—MEAN ANNUAL PROPORTION of MORTALITY among every 1,000 LIVING INDIVIDUALS of the ENGLISH CIVIL POPULATION above 4 YEARS of AGE, 1838 to 1841.

| Age.                 | Ratio of Mortality per 1,000 Living Males of every Age. | Age.                      | Ratio of Mortality per 1,000 Living Males of every Age. |
|----------------------|---|---------------------------|---|
| Under 5 years . . .  | 70.97   | From 60 to 70 years . . . | 43.60   |
| From 5 to 10 " . . . | 9.48  | " 70 " 80 " . . .         | 91.98   |
| " 13 " 15 " . . .    | 5.24  | " 80 " 90 " . . .         | 201.73  |
| " 15 " 20 " . . .    | 7.30  | " 90 " 100 " . . .        | 461.93  |
| " 20 " 30 " . . .    | 9.91  | " 100 and above . . .     | 454.79  |
| " 30 " 40 " . . .    | 11.30   |                           |   |
| " 40 " 50 " . . .    | 15.00   |                           |   |
| " 50 " 60 " . . .    | 23.01   |                           |   |
|                      |   | General Mean . . .        | 23.16   |

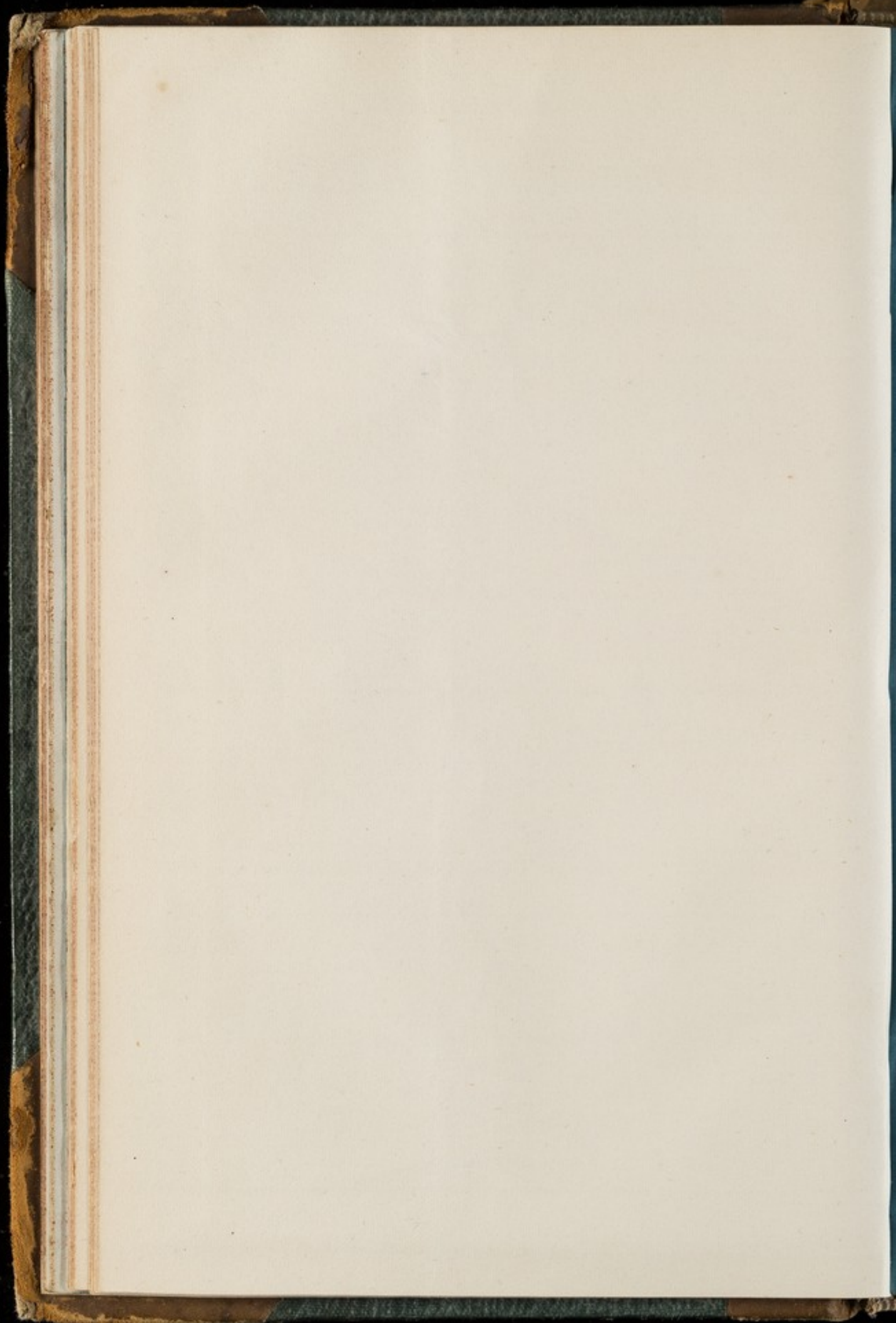




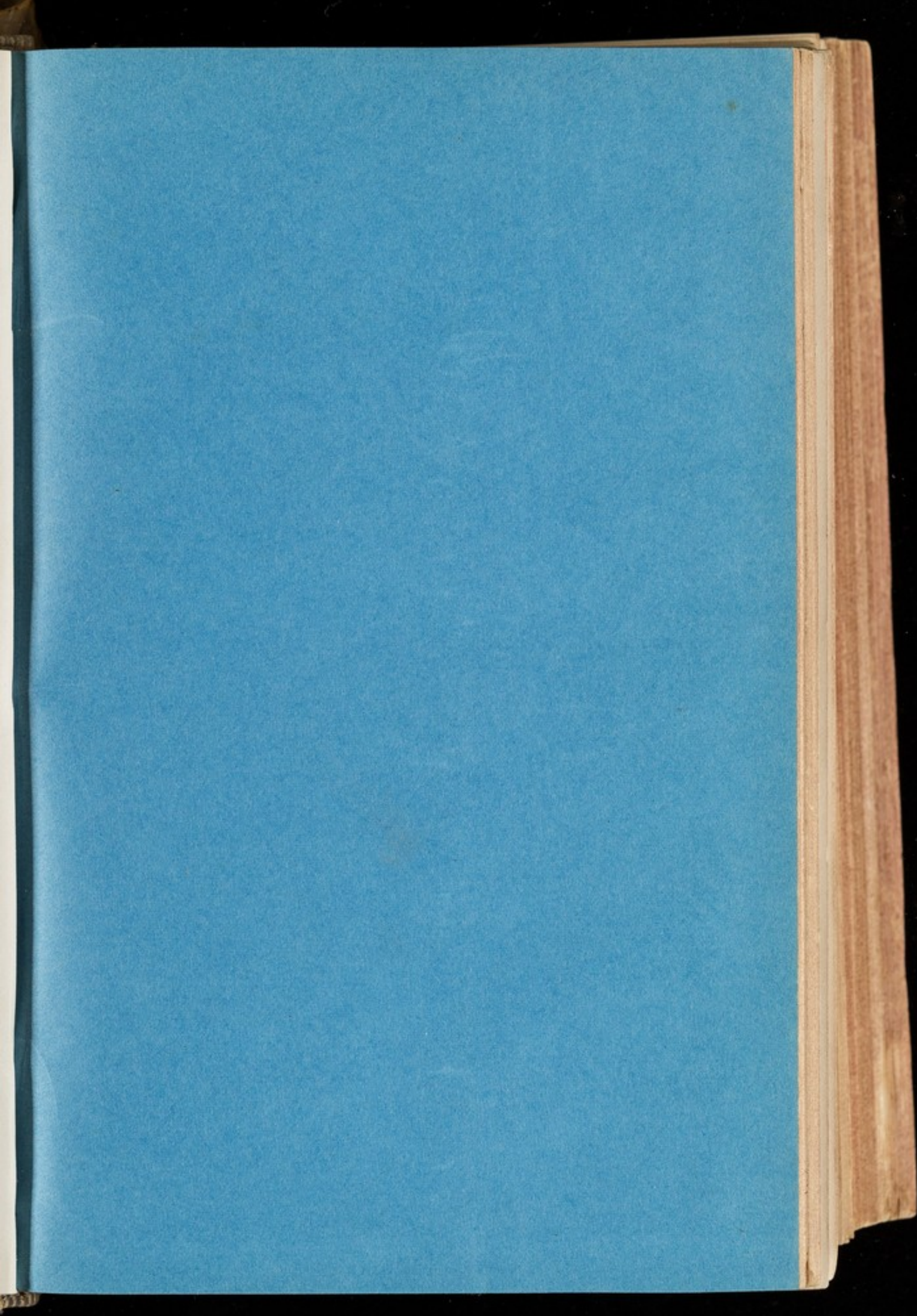




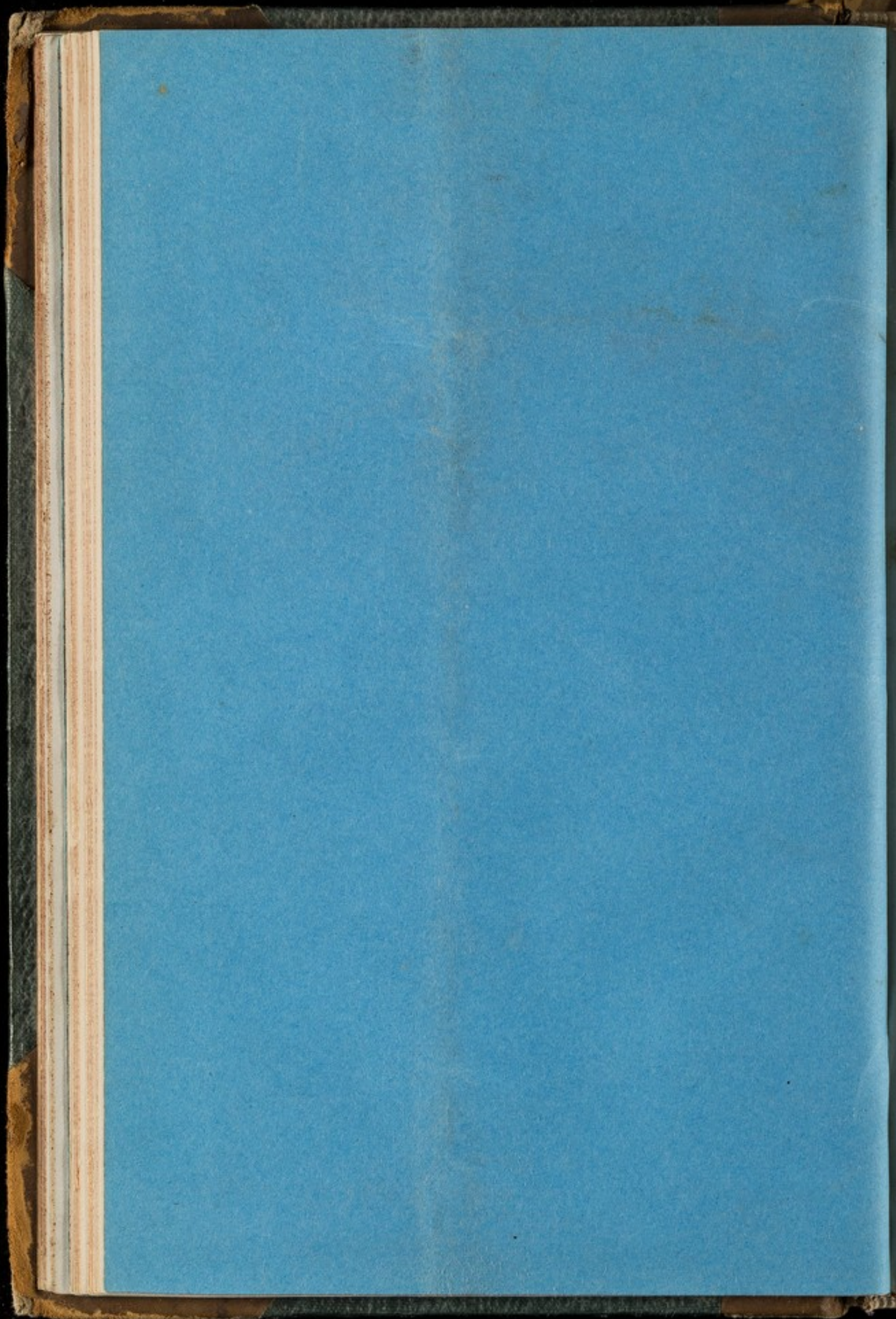














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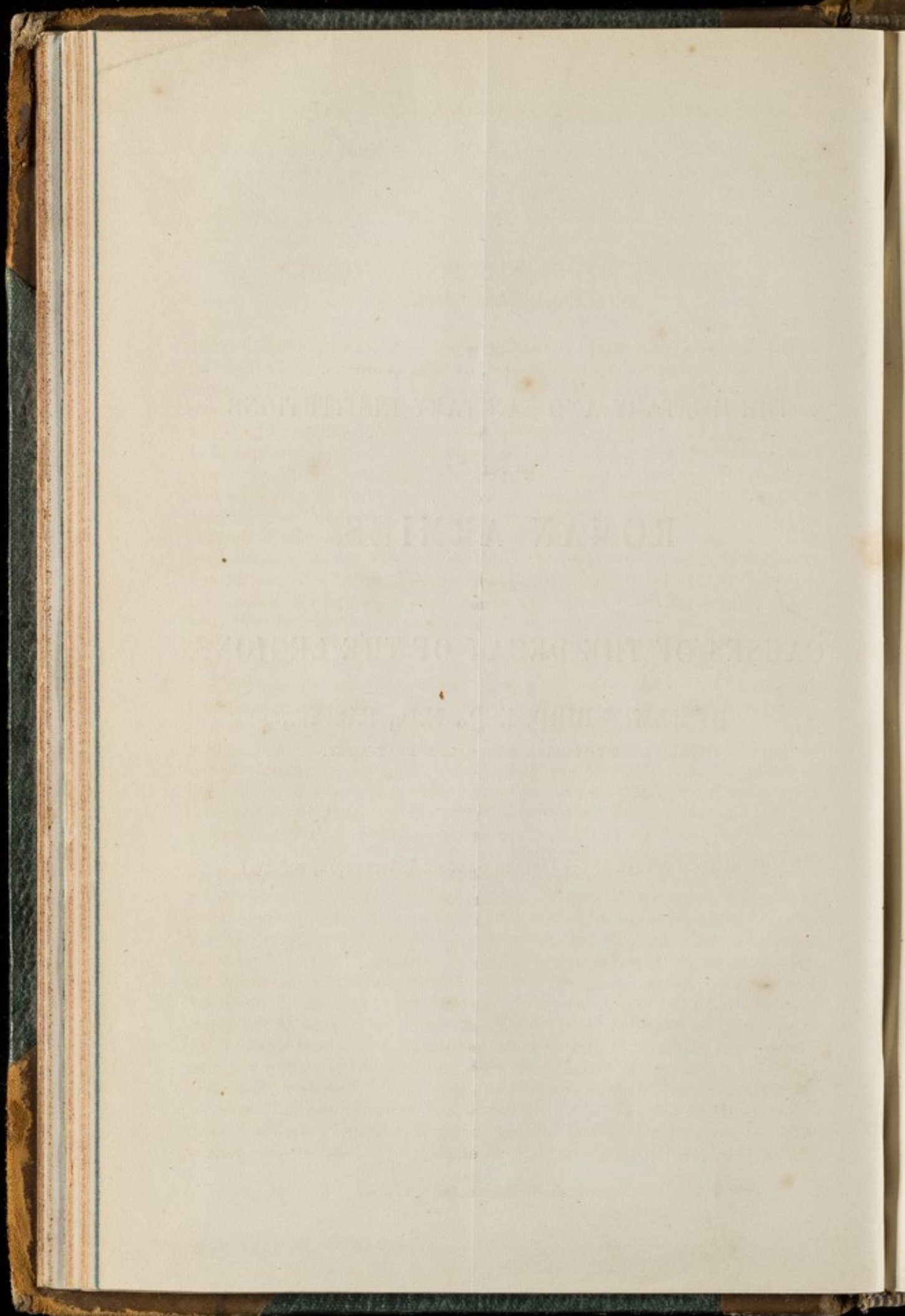
THE MILITARY AND SANITARY INSTITUTIONS  
OF THE  
ROMAN ARMIES,  
AND THE  
CAUSES OF THE DECAY OF THE LEGIONS.

BY JAMES BIRD, ESQ., M.D., F.R.C.P.,  
AND LATE PHYSICIAN-GENERAL, BOMBAY ARMY.

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## MILITARY AND SANITARY INSTITUTIONS OF THE ROMAN ARMIES.

THE Romans, who were a warlike, wise, and prudent people, never thought it unworthy of their reputation, or their genius, to adopt from all nations whatsoever they found practically good for their purpose, either in military discipline or the operations of war. They were not less open to conviction in all that concerned the health of their soldiers, whether at home or abroad; and pursued the best methods for checking the spread of infectious disease both among men and animals. The study of their military and sanitary institutions, therefore, is inseparably connected with their history and their greatness; and the evidence of such history brings conviction that this greatness ever flowed and ebbed together, in proportion to the perfection of their military discipline. No people were ever more sensible than they how skill and practice, in the art of war, were superior to valour, and could secure for a few victory over armed but undisciplined hosts. By a strict observance of discipline in their camps, by unremitted and constant training to the exercise of arms, by unwearied cultivation of all the arts of war, and by a strong patriotic sense of their own interest, in the prosperity and preservation of a free government, the Roman soldiers derived confidence and courage from a knowledge of their profession; and were, for nearly nine centuries, invincible against the impetuous but irregular onset of barbarians in battle. Inferior in numbers and stature to the Gauls, Germans, and Spaniards, and yielding to the Greeks superiority in genius and knowledge, yet the Romans, under the Republic and the first Emperors, became masters of the fairest and most productive provinces of the ancient world, and spread the terror of their name among the most remote nations of the earth.

Though the discovery of gunpowder and the introduction of fire-arms have produced a difference between the ancient and modern practice of the art of war, yet the principles of military organisation and of warlike operations have been, and ever will be, the same, notwithstanding modifications and improvements of destructive instruments of warfare. Much of what we now carefully follow, in our system of obtaining recruits rather from the provinces than the towns, of enlisting men at the proper age of manhood, of attending as much to the constitutional vigour of men as to the greatness of their stature, of examining the features, the eyes, and make of the limbs, as indicating the qualities of good recruits, and of rather selecting them from the manly trades of huntsmen, smiths, and carpenters, than from the more effeminate ones of confectioners and weavers, was fully appreciated and attended to in raising and organising the armies of ancient Rome.\* But in the latter times of the Roman empire, when, amidst the general

\* Vegetius de Re Militari, lib. i. c. 2, &c.



corruption of manners, the decay of patriotism, and the avaricious exactions of officers in command, recruits were less carefully chosen than they had been under the Republic and first Emperors, neglect of this first of duties for the good organisation of the Roman armies became, among other causes, a source of their weakness and decay. It may be profitable, but at all events interesting, for us to look more minutely than we are wont to do into the military practices of the Romans, through the light of their own historians, and to learn what modern customs have borrowed from them, or may now claim as improvements of more recent times. A careful and unbiassed examination of this subject might, perhaps, dispose us to make some abatement of our modern claims and pretension of superiority, over those who went before in reducing a knowledge of arms into an art, or in moulding it into precepts for the strategic manœuvres of general engagements, or the manner of conducting sieges.

The Greeks, in these as in other matters, were the preceptors of the Romans. The military science of both peoples embraced two distinct heads, namely, strategy or military command, and a knowledge of tactics, or military evolutions. The one was called the *art imperatory*, and the other the *art of tactics*,\* a combined knowledge of these being requisite to form a great and accomplished general. The latter could not, in the long run, secure success in war, unless the general in command, from due foresight and acquaintance with things necessary, made all requisite arrangements for provisioning his army, maintaining the health of his soldiers, enforcing discipline, and preparing, with due care and science, all warlike implements and engines, that might be called for in warlike operations.

Among the Greek authors who directed attention to these subjects, and whose names are frequently quoted by later Roman writers, were, Iphicrates, Evangelus, Pyrrhus the celebrated King of Epirus, and his Thesalian minister Cineas, who appears to have epitomised the many volumes which Æneas wrote on the theory and art of war. But the original and last only of these works is now extant, and all that we know of the others must be gathered from the later Roman writers, beginning with Polybius, the master and companion of Scipio Africanus; and who, in addition to his excellent history of the wars of the Romans, wrote a system of tactics which has been lost. Professionally and practically he was well acquainted with military operations, and was present with Scipio at the siege and destruction of Carthage B.C. 140. Many passages of the history indicate his extraordinary skill in matters of war. In an extract from the sixth book he has vividly described the constitution of the Roman legions in those patriotic ages of the Commonwealth when, as Gibbon observes, and like ourselves at this moment, the use of arms was reserved for citizens who had a country to love, property to defend, and a duty to maintain. In latter times of the Emperors Trajan, Hadrian, the Antonines, and Valentinian the Second, we possess the more elaborate treatises on tactics of Ælian, Julius Frontinus, and Flavius Vegetius, the last of whom is the most complete expositor of all the Roman military institutions. He was the co-temporary, as it appears, of the Emperor Valentinian II. A.D. 375-392, and not only wrote the military institutions

\* Xenophon, *Cyropæd.* lib. viii. c. 27.



of the Romans, but a work on the distempers of horses and cattle, and the best methods of preserving their health, and preventing the spread of infectious diseases.

An acquaintance with military history, and the classical records of the origin and art of war in former ages, has ever been deemed a part of necessary acquirement for an accomplished military leader, and what had in this respect been learned so well by Cæsar gives life and vigour to the vivid narratives of his own campaigns. Modern military customs, in every department of the service, have been borrowed from the Greeks and Romans. Surely then a classical and historical knowledge of what they knew on the subject of organising armies, of training and exercising soldiers, of supplying and provisioning troops, of preserving their health, of disposing them in order of battle, of entrenching their position before superior forces, and of attacking and defending fortified places, will be no mean foundation for special training in the more enlarged and improved system of modern warfare. On all of these heads Vegetius is capable of supplying useful information, and he drew his inspiration, as he tells us, from the commentaries of Cato, Celsus, Trajan, Hadrian, and Frontinus on the Art of War.

In this lecture I propose to bring briefly before you—

1st. The constitution of the Roman armies and military establishments, under the Commonwealth and the Emperors, their discipline, training, and equipment.

2nd. The mode of conducting and provisioning their army, and the means of preserving its health.

3rd. Their system of selecting defensive military positions fortified by nature and art.

4th. The causes of the decay of the legions.

1st. The Roman armies consisted of the infantry and cavalry of the legions, of an establishment of engineers and miners, accompanied by all the machines necessary for besieging and defending fortified positions, and of the auxiliary or mercenary troops made up of different nationalities, that were bound together by no common tie, either of unity of discipline, acquaintanceship, or natural disposition.\* “But Roman bravery,” says Vegetius, “was in the main powerful according to the discipline of the legions;” an observation not to be lightly passed over or lost sight of by ourselves, who, in organising means of national defence, by our militia and rifle corps, have adopted a system at once the most economical and best suited to the self-reliance and habits of the English people. In the best times of the Commonwealth the Roman citizen was individualised into the Roman soldier, and it was by a like system of national military development, and by perfecting practice in the exercise of our national weapon the bow, that our countrymen won the battles of Poitiers and Agincourt.

The auxiliaries were in many respects similar to our own subsidiary troops in India; but the number of legionary soldiers in the army was generally more considerable than that of the auxiliaries. The recruiting and enrolment of the soldiers of the legions, on the authority

\* Vegetius de Re Militari, lib. ii. c. 2.



both of Polybius and Vegetius, were carried out with the greatest care and attention under the Commonwealth,\* due regard being paid to the essential merit of descent, age, strength, and military stature, things that were less attended to in the latter days of the Empire. The last author lays much stress on the necessity of attending to these things in the following words: "Juventus enim, cui defensio provinciarum, cui bellorum committenda fortuna est, et genere si copia suppetat, et moribus debet excellere: honestas enim idoneum militem reddit. Verecundia, dum prohibet fugere, facit esse victorem. Quid enim prodest si exerceatur ignavus—si pluribus stipendiis moretur in castris? Nunquam exercitus profecit tempore belli cujus in probandis tyronibus claudicarit electio,"†—"For the youth, to whom is committed the defence of the provinces and the fortune of war, ought, if the supply may admit, to be distinguished by birth and for conduct: for a sense of honour makes the fit soldier. Self-respect, while it prevents flight, makes him victorious. For what does it profit if the dastard be drilled—if through several campaigns he should be lingering in the camps? That army never was serviceable in time of war whose organisation was defective in making choice of recruits."

Before being admitted into the service, or distinguished by the military mark, the recruits were examined in respect of their physical and mental capacity for duty, and then put on trial as to whether they possessed the requisite degree of military self-reliance;‡ they had then an oath administered to them with imposing solemnity, that they would be obedient to their commanders and execute their orders to the utmost of their power.§ Having passed through these preliminaries of admission, they were taught the military step, exercised to run, to leap, to swim, to carry heavy burdens, to cut and thrust with the sword, to acquire the familiar use of all arms, offensive and defensive, and to perform a variety of evolutions necessary for their movements in battle. The recruits were thus carefully chosen, and, having been daily exercised for the space of at least four months, were then thought sufficiently prepared for being embodied in the legions.

In the time of the Commonwealth, when their military instructions were drawn from the most perfect model of Roman discipline, the number allotted to each legion was four thousand two hundred, and sometimes five thousand, when any great or unusual danger appeared. "Never more than two legions, besides auxiliaries," says Vegetius, "were at this period sent under one consul, against the most numerous forces of their enemies, such being their perfect discipline and self-reliance that they were found equal to all the exigencies of war." In later times, however, under the Emperors, the imperial legions, as described by Gibbon on the authority of Vegetius, were divided into ten cohorts and fifty-nine companies, under the orders of a corresponding number of tribunes and centurions. They consisted in the whole of six thousand one hundred heavy-armed foot soldiers, associated with a body of cavalry amounting to seven hundred and twenty-six

\* Polybius, lib. vi. c. 1; and Vegetius de Re Militari, lib. i. c. 1 to 8.

† Vegetius de Re Militari, lib. i. c. 7.

‡ Vegetius de Re Militari, lib. i. c. 8.

§ Polybius, lib. i. c. 63.



horsemen (figs. 1, 6, 7), who with the light-armed foot, consisting of the *ferentarii*, archers (fig. 4), slingers (fig. 3), and *balistarii*, composed the wings



FIG. 1. — Legionary Soldier; from the column of Trajan.



FIG. 2. — One of the Hastati; from the column of Antoninus.



FIG. 3. — Slinger; from Trajan's column.

of the army. The first cohort, which exceeded the others in the number and quality of the soldiers, selected from men of family and education, was appointed to guard the golden eagle and the images of the emperors (fig. 5).

The legionary troops were either heavy or light armed. The former, drawn from men in their full strength and vigour, consisted of the *hastati* (fig. 2), the *principes*, and *triarii*, while those younger and of inferior condition were set apart for light-armed troops. From the foundation of the city to the time of the Emperor Gratian, A.D. 375, the arms of the foot soldier were, a helmet, a cuirass or breastplate, greaves on the legs, and a buckler on the left arm. Their missive weapons were a double-edged Spanish sword, suited to either give point or to strike; sharp, iron-headed javelins a foot in length, carried in the buckler and used as darts; and the heavy javelin, six feet long, which was launched with great effect against cavalry at the distance of ten or twelve paces.



FIG. 4. — German Archer; from the column of Antoninus.



FIG. 5. — Standard-bearer; from Trajan's column.



## 8 MILITARY AND SANITARY INSTITUTIONS OF ROMAN ARMIES,

The armies of Rome were commanded by officers of liberal birth and education, among whom the præfect, on whom devolved the chief command, in the absence of the emperor's lieutenant, was considered the special officer of the legion. The tribunes, centurions, and the soldiers in general, were under his orders, and on him devolved the duty of maintaining strict discipline and obedience, and of exercising daily the



FIG. 6.—Legionary Trooper; from the column of Antoninus.



FIG. 7.—Mounted Archer; from the column of Antoninus.

legionary horse and foot. Inferior in rank to this officer there were also præfects of the camp, and of the engineering train of miners, workmen, and mechanics. The authority of the former extended over the sick and the physicians in charge of them; and to him was assigned the duties of selecting the site of the camp, of superintending the entrenchments for its defence, of having charge of the baggage, and of inspecting the tents and huts of the soldiers. He had also the camp carriages and horses at his disposal, and all the war engines were under his direction. The præfect of the engineering train and workmen had the duty of constructing barracks in the winter camps, and of making and repairing the various kinds of engines and machines necessary for the attack and defence of places.

2nd. The Romans were fully alive to and sensible of the truth of the adage, "*Sæpius enim pænuria quam pugna consumit exercitum, et ferro sævior fames est,*"\* "For want often wastes an army more than battle, and famine is more terrible than the sword." In recognising the force of this, they made it a point of supreme importance and necessity, when entering on a campaign, to secure plenty of supplies for their armies. Provisions of all kinds, forage, and corn, estimated in quantities according to the number of troops, horse and foot, were ordered to be provided by the provinces, and stored up in the strongest and most convenient cities. By careful management of the magazines, and a frugal distribution of the provisions to each man without distinction of rank, sufficient supplies for the army were generally secured. The soldiers were thus provided with wood in winter, water in summer, and with corn, wine, and vinegar at all times. The Roman commanders knew full well the value of

\* Vegetius de Re Militari, lib. iii. c. 3.



foresight in these matters, without which the discipline and valour of their finest armies were as nought, while their numbers would have vanished away like water in the desert.

Nor were they less careful to provide against the contingencies of disease among their troops, and to adopt means for preserving the health of their soldiers. They paid the greatest attention, therefore, to the choice of a healthy situation for their encampments, remote from unwholesome marshes, and provided with good water; not to expose the soldiers without tents to the heats of summer, or on dry, arid plains without shade or shelter; to supply them in winter with fire-wood and warm clothing, and never to expose them during night to either frost or snow; and to begin their march by break of day during the extreme heats of summer. They considered hard, marshy water a kind of poison, and the cause of epidemic diseases. It was imposed as a special duty, therefore, on whoever was in chief command of the troops, and also on the tribunes, that the soldiers should be duly practised in the military exercises, such being more effectual than medicine in preserving their health; while those who were sick were supplied with suitable diet and diligently attended by the physicians. Frequent changes of encampment were made, during summer and autumn, in order to obtain good water and prevent the corruption of the air: in short all the sanitary provisions of military hygiene, which through the public press and the authorities have been enjoined in this country on all concerned, as if parts of a new science discovered but yesterday, were fully appreciated by and acted on by the Roman commanders.

It was thought indispensable that the commander-in-chief, on whose foresight and bravery depended the fortunes of his country and the glory of the state, should not only have perfected himself in the science of tactics and the art of war, but be well instructed in the means of husbanding his resources and preserving the health of his men. He was expected to study the strength, spirit, and composition of his army, whether made up of raw recruits or veteran soldiers, and to perfect discipline and order by strictly enforcing obedience to his commands, under all the contingencies of place and circumstances.

In the 3rd place the Roman generals were sensible that not only was the success of a campaign mainly dependent on those things, but that to secure victory they should endeavour to obtain the advantage of high ground and superior situation before disposing their troops in order of battle. They could fully estimate the advantage of occupying any elevated position, rendered more formidable, to a numerous enemy in front, when strengthened against their attacks by either a wood or a morass. They could thus drive back their antagonists with greater impetuosity, throw their darts and javelins with more effect, and force back their struggling assailants with almost certainty of defeat. When drawing up their troops also, in order of battle, they placed the more experienced and veteran soldiers, called *principes*, in the first line; posting in their rear a second line of select infantry soldiers, called *hastati*, armed with cuirasses, javelins, and pikes. These two lines of soldiers, who were experienced and heavy-armed, were never to break their order, even to join in pursuit; but were to remain immovable as a wall, and receive the enemy's charge with steadiness and stability. Behind these were drawn up two other lines of light-



armed foot, the *ferentarii* and *martrobarbuli*. The former consisted of light active soldiers and young archers, expert in the use of the javelin; the latter were composed of the youngest archers, skilled in the use of the small javelin and armed with light shields. These two bodies, like our light infantry soldiers, were to begin battle by advancing to annoy the enemy with their darts and arrows. If they put them to flight they pursued them in conjunction with the cavalry; but if repulsed they fell back on the two first lines, retiring through the intervals to the rear; while the two foremost lines sustained the whole weight of the enemy's attack. The cavalry were always drawn up on the wings of the infantry.

It was also part of the Roman system of war, in erecting fortified cities or castles for their magazines, to select for their site high and steep places surrounded by the sea, or made more difficult of access by a marsh or a river, and these were artificially made stronger by means of walls, ramparts, and ditches. For the construction of ramparts parallel walls were built at short distance from each other, and filled up with the earth taken from the ditches. The inner wall was considerably lower than the outer, so that the space when filled up should present a graduated slope from the city to the top of the rampart. The ditch also was made broad and deep, and so flooded with water that the depth of it might effectually prevent the mining operations of the besiegers from without. The gates of the fortification were strengthened by the woodwork being covered with leather and plates of iron; and in some cases there was an additional work thrown up before the gate, with a portcullis suspended at the entrance by means of iron rings and ropes, and capable of being let down on the approach of an enemy. The magazines of these fortified places were well stored with coals, wood, and military arms of all kinds, and quantities of bitumen, sulphur, and liquid pitch were kept ready for burning the machines of the besiegers. A vivid and heartrending description of the use and destructive effects of these things, both by the Jews and the Romans, is presented to us in the various accounts we possess of the siege and destruction of Jerusalem by Titus.

I come now in the 4th place to trace the causes by which the armies of Rome, long invincible, and which had been the terror of her enemies, so fell away from their pristine perfection and discipline as to lose the respect of their barbarian enemies, from the middle of the fourth to the end of the fifth centuries of the Christian era.

The military constitution of the ancient legions, as I have described them, prescribed that the soldiers should be recruited from the best and bravest of the Roman citizens, who were animated, in the performance of duty, by a truly patriotic love for the protection and glory of their country; while they saw that public places of rank and emolument were open to their ambition, and obtainable as the rewards of their own merit, exertions, and long services. So long as such were the prizes to be contended for, the Roman soldiers cheerfully gave themselves up to all the labour and rigidity of strict military discipline, and all the danger and hardships of foreign service. But soon after the age of the Antonines, when, through a long peace, the general felicity and luxury of Roman citizens, the love of refinement, and the corruption of manners, the manliness and greatness which had been fostered under great and popular governments now gave way to



effeminacy and degeneracy, the Barbarian countries of Europe that had been subdued supplied the legions with excellent but not patriotic soldiers; the legions were less carefully recruited than they had been, and filled with mercenaries; the employment by the Emperors of prætorian guards for the protection of their persons; the lost sense of national honour, once nourished by creditable ambition, and the want of public courage, all contributed to weaken the discipline and obedience of the Roman armies: till, as Vegetius says, the name of Legion remained, but its strength and substance were gone; the only fountain of honour or of justice was the capricious will of the sovereign, who trusted for defence to a mercenary army; which demanded from him concessions in proportion as the need of his government increased.

The Roman soldiers thus yielded to the natural indolence and indulgence incident to human nature; threw aside their obedience and allegiance; and gave way to the effeminacy of the times. They complained that their duties were too severe, their arms too heavy, the rewards too distant, and the discipline beyond their strength. They were consequently permitted to lay aside their armour, to make use of lighter weapons of defence, and to relax their accustomed military exercises, which had rendered them superior to their enemies. The consequences of all these things were, that when they were brought into battle against the hardy Goths and Huns of the North of Europe, who were expert and practised in the use of the long bow, the Roman armies fled before them in dismay.

In the experience of these things among the Romans, we may derive a not unprofitable lesson for ourselves, "that constant and well-appointed preparation for war is necessary to preserve peace."







J. Symonds Esq. C.B. D. 21

With the author's kind  
regards

## MILITARY HYGIENE.

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A LECTURE DELIVERED AT THE ROYAL UNITED SERVICE INSTITUTION.

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(For private circulation only.)

## LECTURE.

Friday, May 27th, 1870.

SIR T. GALBRAITH LOGAN, K.C.B., M.D, Director-General Army  
Medical Department, in the Chair.

### MILITARY HYGIENE.

By F. DE CHAUMONT, Esq., M.D., Army Medical School, Netley.

THE subject which I have the honour to bring to your notice this day is one of so comprehensive a character, that I might well hesitate before attempting its exposition in a single lecture. I hope, however, to be able to lay before you a few points of interest selected from the wide range of inquiry which the study of hygiene embraces. Let me say a few words in the first place as to the nature and character of the study. Hygiene (or *medical police* as it used to be called in this country) is that branch of study which treats of the laws of health. This is its widest application, and we hesitate to call it a science, chiefly because it is based upon many other divisions of knowledge which are themselves still imperfect; it is, in fact, as yet merely an art by which we apply to the preservation of health the points of knowledge derived from many sources. Its highest aim being to produce the "*mens sana in corpore sano*," it is obvious that nothing which bears directly or indirectly upon health is excluded from it, which is simply tantamount to saying that it includes everything cognisable by man. But, the causes that act and react upon the human economy being practically infinite, to integrate them so as to produce a definite expression which shall be presented as a perfect science is hopeless. All we can hope to do is to approach as nearly as possible to the limit which can never by any possibility be reached. But within this vast circle there are others to which we may profitably confine our attention for the time, and within which we may direct our inquiries to those points in the material well-being of man, which are more immediately under our control. Hygiene, then, is the art of preserving health by removing all that is injurious to life, and supplying all that is needful for life. It aims at rendering life vigorous, painless, free from disease and prolonged, so that a truly hygienic being would cease to exist purely from natural decay. Whether or not it would be possible to lengthen life materially or indefinitely, is a speculation which has often suggested itself, but which we are at present too ignorant to consider.

Hygiene, although but recently placed on a scientific basis, is by no means a new object of human study; it is at least as old as history itself. The ceremonial law of Moses was as perfect a system as the knowledge of the time could produce. Hippocrates embodied in his works the



precepts of many older and now forgotten writers. The life of the Greeks was eminently hygienic. The vast systems of baths built by the Romans, their system of sewers, their mode of water supply and many of their domestic arrangements, proved how far they understood the art of health in peace, while the rules of Vegetius may be even now profitably studied as a guide in time of war. It was reserved for the fanatical asceticism of the middle ages to outrage every law of health, to impose upon the world the idea of the contemptibility of caring for the body, and in fact to accomplish what may be fitly termed the apotheosis of filth! What can we think of a community in which the cleanliness of the body was regarded as a pollution of the soul and the cynosure of all devout eyes was such a hideous mass of filthy insanity as St. Simeon Stylites! The outcome of all this was, that epidemics of a virulence unknown to classic times devastated Europe, and it was only with the revival of letters, when the intellect of Europe began to shake off the shackles of tradition and priestly domination, that a return was made to the paths that had been so long forsaken. Even now with all our boasted science, we are only going back in a measure to the principles already firmly established fifteen centuries ago, but the practice of which disappeared with the fall of the Western Empire. We are even now in some practical points behind that age, and it will be long before we make up for the death-like sleep of a thousand years, during which, as Michelet says, not one in Europe ever took a bath!

Hygiene in its detailed application includes the following points:—the supply of *air, water, food, clothing, shelter* and *exercise*, and the removal of *waste* and *effete* products arising from what source soever. Deficiency in the supply of the above requisites weakens the human frame and induces constitutional diseases; neglect in the removal of waste products favours the development of actual poisons which give rise to epidemic and zymotic diseases. This is of course a general statement requiring modification according to individual circumstances. The relative importance of each cause advances, both as regards rapidity and intensity of effect. Thus, whenever a sudden invasion of disease takes place, affecting a large proportion of a community at the same time, such as an attack of diarrhoea, it is generally due to some poison introduced through the water-supply, and it is seldom that inquiry fails to trace it to this source. On the other hand, the most fruitful source of disease, although less immediately recognisable in its operation, is impure air from defective ventilation. While to bad water we owe in a large measure the propagation of such diseases as diarrhoea, dysentery, cholera, typhoid fever and the like; to bad air we owe pulmonary consumption, pneumonia, typhus fever, scrofulous disorders, and many others, some apparently *generated* by the products of respiration, others unquestionably *favoured* and propagated by a want of proper interchange of air. The importance of this question with reference to the health of the soldier is so great that I propose to ask your attention for a little to the subject. The necessity for good ventilation and the proper methods of obtaining it have been very fully discussed of late years, and it may be considered as pretty



generally admitted that it is a question of the very gravest moment. Death-rate has been shown to increase in a pretty regular ratio with the increase of inhabitants to the square mile, and, putting exceptional causes aside, the most virulent disease and the greatest mortality are to be found in the most crowded localities. Of course among the civil population, poverty and starvation have to be taken into consideration, for among them crowding necessarily means poverty, want of means compelling them to huddle together to save the crushing expenses of house-rent and fuel. Among soldiers, however, it is possible to eliminate these disturbing causes to a certain extent, for the men are selected lives, are, on the whole, well fed and clothed, and are not more exposed in time of peace to vicissitudes of temperature than the civil population. Yet, in spite of these advantages, and putting aside all other deleterious influences, the researches of the Royal Commission of 1857 showed that the death-rate of the soldier at home was up to that time *twice* that of the civil population of the same ages. To what was the death-rate chiefly owing? To two diseases mainly, viz., typhoid fever and pulmonary consumption (or a destructive lung-disease). Now the former is almost entirely due to bad conservancy, that is, neglect in the removal of excreta, and the latter by far the more destructive, to bad air, caused by bad barrack accommodation and deficiency of the supply of fresh air. The whole question was carefully investigated by the Commissioners, and the conclusion arrived at was, that to *bad air* the greater part of the Army mortality in time of peace was due. This was a conclusion for which the public generally was hardly prepared, but its truth was borne out by other investigations, for the same results arising from similar conditions were found to obtain in Continental Armies as well as in our own. Nay, further than this, similar influences were also found producing analogous effects among the lower animals, horses in badly ventilated stables, dogs in confined kennels, and even monkeys in ill-constructed dwellings were found to fall rapid victims to destructive lung disease, having in many cases characters similar to that which carries off so many of our soldiers. Since that time a very great change has taken place, increased accommodation and better means of ventilation having been provided in accordance with the recommendations of the Barrack Commission assembled in the following year, 1858. Imperfectly as these recommendations have been as yet carried out, the results are most encouraging, for the death-rate of the soldier now is reduced to *one-half* of what it was before the Crimean War, a most cheering and gratifying fact, even if we admit that it is not entirely due to this one set of changes. For although numerous causes have undoubtedly combined to bring about this result, yet enough of it may be traced to direct hygienic improvements to encourage us to make every effort to promote further advances in this direction.

I have alluded to the recommendations of the Barrack Commission as having been imperfectly carried out; let me now explain what I mean. The recommendations were that each soldier should have 600 cubic feet of space in barracks, and 1,200 in hospitals, and that the air of this space should be changed *twice* in the hour, thus giving



1,200 cubic feet per head per hour, in barracks, and 2,400 in hospitals. To accomplish this, improved methods of ventilation were recommended and in some cases supplied. I have now made detailed experimental inquiries in a good many barracks and hospitals, and I take this opportunity of laying before you very briefly the results, which may be seen by a glance at the accompanying table. From it you will observe that the rate of change of air is considerably below *twice* in the hour in the majority of instances, so that to provide even the moderate amount of air proposed by the Barrack Commissioners, a much larger initial cubic space would be requisite, or in other words the number of occupants ought to be reduced:—

| Place.  | No. of<br>times air changed<br>per hour. | Cubic space<br>required per man to<br>give the<br>proposed amount<br>of air, viz.,<br>1,200 in barracks,<br>and 2,400<br>in hospitals. | Average actual<br>amount supplied,<br>taking the<br>initial space at<br>600 per man. |
|---|--|--|--|
| Barracks.   |  |  |  |
| (a) Netley .....  | 3.30                                     | 365  | 1980   |
| (one room)  |  |  |  |
| Hilsea .....  | 3.25                                     | 370  | 1950   |
| (brick huts)  |  |  |  |
| Fort Brockhurst   | 3.00                                     | 400  | 1800   |
| Aldershot .....   | 2.35                                     | 520  | 1410   |
| (ventilated on<br>principles of<br>Barrack<br>Commission) |  |  |  |
| Chelsea .....   | 2.20                                     | 550  | 1320   |
| (no outlet<br>shaft)                                      |  |  |  |
| .....   |  |  |  |
| Hilsea .....  | 1.74                                     | 690  | 1044   |
| (room over<br>stable)                                     |  |  |  |
| (a) Chatham .....   | 1.70                                     | 710  | 1020   |
| (a) Netley .....  | 1.65                                     | 730  | 990  |
| Fort Elson .....  | 1.30                                     | 925  | 780  |
| (no shaft)  |  |  |  |
| Gosport .....   | 1.20                                     | 1000   | 720  |
| Tower .....   | 1.20                                     | 1000   | 720  |
| Anglesey .....  | 1.20                                     | 1000   | 720  |
| (a) Milton Bar-<br>racks, Grave-<br>send .....            | 1.18                                     | 1010   | 708  |
| Aldershot .....   | 1.16                                     | 1020   | 696  |
| (original rooms<br>in permanent<br>barracks)              |  |  |  |
| (a) Chatham .....   | 0.80                                     | 1500   | 480  |
| (a) Netley .....  | 0.72                                     | 1670   | 432  |



| Hospitals.                                 | No. of<br>times air changed<br>per hour. | Cubic space<br>required to give the<br>proposed amount<br>of air, viz.,<br>2,400 feet per hour. | Average actual<br>amount supplied<br>taking the<br>initial space at 1,200<br>cubic feet. |
|--|--|---|--|
| Hilsea.....                                | 3·12                                     | 770   | 3744   |
| Herbert.....<br>(Woolwich)                 | 2·20                                     | 1095  | 2640   |
| .....                                      |  |   |  |
| Portsmouth*...<br>(Garrison Hos-<br>pital) | 1·10                                     | 2180  | 1320*  |
| (a) Chatham.....<br>(Fort Pitt)            | 0·90                                     | 2660  | 1080   |
| (a) Netley.....                            | 0·90                                     | 2660  | 1080   |
| (a) Chatham.....<br>(Fort Pitt)            | 0·55                                     | 4350  | 660  |
| (a) Netley.....                            | 0·55                                     | 4350  | 660  |

From these numbers we see that the results contemplated by the Commission have been obtained in only *five* barracks and *two* hospitals, viz., those above the dotted lines in each table. The experiments from which the calculations have been made were carried out by myself, except in those cases marked (a).

I think it will be admitted, on considering these results, that a good deal still remains to be done, even to arrive at the moderate degree of ventilation proposed by the Commission. I am, however, far from admitting that even this would be sufficient to ensure perfectly hygienic conditions, but it would still be a great advance upon the actual state of things. It cannot be too frequently insisted upon, that there is a practical limit to the number of times that air can be changed *without draughts* by ordinary appliances, and that therefore there is a limit to the number of occupants in an air space, which cannot be exceeded without serious danger to health, and even life. Theoretically speaking, the cubic space a man occupies is immaterial, *provided* always that the power of changing the air is unlimited; but it is perfectly plain that, if we cannot change the air more than twice in the hour, four men in that air space will only get each one-half as much as two. Therefore in placing a limit to the cubic space allotted, the possibility of changing the air sufficiently often, ought to be one main element of the calculation. The whole question is one of expenditure, for of course increased cubic space means more extended barrack accommodation, and greater outlay, both for warming and other things. On the other hand, special appliances for ventilation are also costly, and few have as yet given much satisfaction. I do not doubt, however, that we shall arrive ultimately at some means of combining economy with efficiency in this

\* In this case the initial cubic space was only 800 feet, so that the air supplied was only 895 cubic feet per hour. Had the wards been full the space would have been only 680, and the amount of air 748 cubic feet only.



matter, and securing to the soldier an habitation which shall be really a shelter, and not a manufactory of disease.

I have dwelt thus particularly upon the question of ventilation as being the most important with regard to the soldier's health in time of peace; it is the most fruitful source of mortality, and the most constantly operating cause of disease. Of course it is not actually of less importance in time of war, but it is relatively less so on account of the presence of so many other causes which unite to attack the health of the soldier. I propose now in the remainder of this lecture to refer to some of the more important of these.

In the first place the actual amount of physical exertion to be gone through is generally greater in time of war. Can we do anything in time of peace to prepare the soldier for this? For we must never forget that the trade of the soldier is war, and that, but for the existence or the possibility of war, he would cease to have a *raison d'être*. Many soldiers pass through their whole career without ever encountering actual warfare, but their whole training is to render them fit for a possible contingency, which, it is true, may never arise, but which the soldier must ever be prepared for. The amount of physical exertion which a man can undergo depends upon many things, the way he is fed, the way he is clothed, the climate he is in, and innumerable other causes which influence his health, morally and physically. Our first care, then, should be to preserve his health at the highest standard in time of peace by supplying an ample and wholesome diet, appropriate clothing, well ventilated barracks, &c. But there still remains the question of training and exercise. How far should these be carried in peace, with a view to the severer trials of war? It is the opinion of some that the amount of physical labour in peace should be strained to the utmost, even beyond what is likely to be required in war, so that when the latter comes it may be found more easy of endurance. It was on something like this principle that the Romans acted, giving their men so much labour in peace time, that they hailed the approach of war with delight, as a season of rest and variety. This was, perhaps, good policy in a nation eminently aggressive, who loved war better than peace, and claimed to make it an object of attraction to its citizens. But the condition of matters is changed at the present day; we keep an army as a necessity, but a necessity which we regret. We do not desire to instil a longing for war into our citizens; we merely wish to keep the instrument of defence in the highest state of efficiency, ready to be used on the instant when the hour of war does come. Under such circumstances it seems to me that it would be an eminent mistake to train the physique of the soldier too far; full and constant occupation he ought to have, but considerably within the limits of extreme physical effort. It stands to reason that a cord perpetually stretched will lose its elasticity, and probably give way when the important moment arrives. I think this is now pretty generally understood, and it receives an instructive illustration from the practice of professional singers, who by exercising their voices within a moderate compass, find that they can the more easily make an extreme effort when the occasion calls for one.



It is not, however, only in the preparation in time of peace that the power for physical effort depends. Man is a machine, just as much as a steam-engine or a galvanic battery; the amount of force he gives out is exactly proportioned to the amount of convertible material he takes in. We can calculate to a grain the force obtainable from the burning of a certain amount of coal, or the oxidising of a certain amount of zinc, and similarly (though, as yet, somewhat less perfectly) we can calculate the amount of force obtainable from the amount and quality of food supplied to the human economy. And this question of food is at the bottom of all the difficulties and disasters of a campaign. It used, in the great war in the beginning of this century, to be a favourite joke of the French soldiers against the English to say that you should never ask an Englishman if he has *fought* well, but ask if he has *dined* well, and then you may be sure he has fought well. Like many a word spoken in jest, there is deep truth contained in this, of whatever nationality the soldier may be. There can be no doubt that armies have performed prodigies of valour under circumstances of great privation, but we may be sure of this, that as Providence has been said to be on the side of the largest battalions, so it will also be on the side of the best fed battalions. This is well put in the report of an experienced French Officer, Colonel Comte de Clonard, commanding the 81st regiment of the Line. He says: "Devant l'ennemi, il suffit de payer un instant de sa personne; l'exemple des chefs entraîne, électrise: le drapeau fait le reste. Hors de là, c'est autre chose, car on ne se bat pas toujours. Dans les marches et les camps, au milieu de fatigues et d'épreuves souvent nécessaires et glorieuses, c'est par une bonne ou une mauvaise administration qu'on prépare les hommes à vaincre ou qu'on les perd. Il faut donc savoir faire durer le soldat, mais c'est à la condition d'en avoir soin, de lui donner une alimentation suffisamment réparatrice et parfois tonique et variée; il sera dès lors en état de braver impunément toutes les autres misères de la guerre." (Chenu, Campagne d'Italie.) Nothing, indeed, lays a man more open to an attack of disease than encountering it insufficiently nourished. On this principle medical men and the attendants on the sick, never, as a rule, visit a contagious case on an empty stomach, if it is possible to prevent it. Now, in providing for the diet of the soldier in war, two important points have to be borne in mind:—

- 1st. To provide a diet that shall furnish sufficient force for the work required of him; that is, to make the food proportionate to the exercise.
- 2nd. To provide a diet of sufficient variety to prevent the occurrence of scurvy.

The importance of the first point has been more or less recognized at different times, and it would appear that Hippocrates (the great father of medicine) had very clear notions on this point. It was, however, possible to come to a definite conclusion on the subject only after the sciences of chemistry and natural philosophy had been brought to a high stage of advancement, and after the theory of the conservation of force had been recognized. So long as heat, light,



electricity, chemical action, vital force, &c., &c., were considered separate entities, it was hardly possible to treat the question scientifically, but now that all these are admitted to be mere forms of force, or, perhaps more correctly, to be universally and perpetually convertible into each other, equivalent for equivalent, we are enabled to approach the inquiry with more confidence, and to place our conclusions on a more strictly scientific basis. The question is still obscure, but researches are gradually throwing more and more light upon it. After Liebig had pointed out the two important divisions into which food may be separated, the nitrogenous or plastic, and the carboniferous or combustible, the idea long held almost undisputed sway that the former went to repair the tissues whose waste supplied muscular energy, and that the latter were burned off in the lungs and supplied the necessary animal heat. It was therefore supposed that a certain amount of nitrogenous matter and a certain amount of carboniferous matter being given, life could be sustained in efficiency. Further inquiry showed that these views were only partially true, for it was found that all nitrogenous substances were not equally assimilable, some, notably gelatine, although largely present in the bodies of animals, not being capable of being substituted for albumen or fibrin, and not being nutritious at all except under peculiar circumstances. It was also ascertained that the carboniferous aliments required subdivision into two classes, the fats and the carbo-hydrates (the latter including the starches and sugars) which two classes could reciprocally replace each other in certain proportions, but not entirely. A certain amount of mineral matter in the form of salts, either existing in the articles of diet or added in bulk, was also found to be absolutely essential for the preservation of health. Up to this point, the results ascertained were the following:—

1. Living animals absolutely require nitrogenous matter in their diet.
2. The nitrogenous matter may be animal or vegetable.
3. Most animals require a certain amount of fat.
4. Many animals require, in addition, a certain amount of starch or sugar.
5. All animals require a certain amount of salts.

A second series of conclusions are the following:—

1. Some animals (such as dogs and rats) can live on a purely meat diet.
2. Many animals (carnivora) can live upon meat and fat.
3. Many animals (herbivora) live upon vegetable products only (including nitrogenous matter and starch chiefly, with a small quantity of fat.)
- 4a. *Man* can live on vegetable products only, provided they contain nitrogenous matters, starch, and fat in due proportion.
- b. *Man* cannot live and maintain health upon meat alone, or upon meat and fat alone; he requires the addition of starch.

These being the main conclusions, how were they interpreted? It was considered that the carbo-hydrates—starch and sugar—were chiefly employed in giving out the animal heat; that the fat acted



partly in this way, and partly was stored up in the system against contingencies; that the nitrogenous went to repair the wasted tissue, chiefly the muscles, and that it was the wasting of these that supplied the physical force manifested by the individual. These principles are still defended by Baron von Liebig, Lyon Playfair, and other distinguished men; but, on the other hand, a large number of experiments have been made by men of great scientific acquirements, such as Pettenkofer and Voit, Fick and Wislicenus, Lawes and Gilbert, Haughton, Parkes, and others, which seem to point the other way. If the waste of the muscles were the direct or sole cause of force, then, in cases of excessive exertion, some increased elimination of nitrogenous matter would be observable; but the majority of the experiments seem to show that this is not the case, so much so, that in some cases the elimination seems to be lessened, apparently from the increased exercise causing retention of the nitrogen to provide for the increase in size of the muscles, which usually follows. On the other hand, increased exertion is attended with increased elimination of carbonic acid and vapour of water, showing a marked excess in the combustion of the carboniferous matter in the system. The inference suggested by these observations is, that the body is, in the main, like a steam-engine, and that the force evolved is due to the combustion of the fuel supplied. Therefore, it is to the carboniferous elements of food that the energy is in the main due, and not entirely, as was supposed, to the nitrogenous. The body, however, differs materially from an ordinary machine, for the latter wears away without power of reparation, all we can do being to diminish as much as possible the effects of friction. The former, however, has the power of perpetually assimilating fresh material, and continually repairing the waste as it occurs. It is obvious, however, that in the latter case *some* force must be evolved, just as there is force (in the form of heat chiefly) evolved in the friction of the wheels of a machine, and it is important, therefore, to inquire what becomes of this force, how it is employed, or how it is neutralized. It would seem probable that it is partly employed in the digestion and assimilation of the nitrogenous matters, and partly in the elimination of the waste products. Now, as the balance seems to be kept pretty strictly between the amount of nitrogen ingested and egested in a person well fed and in good health, it is probable that the amount of nitrogenous food necessary for the highest efficiency is that which shall preserve this balance most perfectly under varying circumstances. If the amount of nitrogen be diminished below the proper standard, weakening is produced, with emaciation, the result of more rapid destruction than can be repaired by the fresh material supplied. But if at the same time the amount of physical exertion is proportionately diminished, this lessening of the nitrogen is balanced to a certain extent, and can be endured within certain limits, whilst a comparatively small quantity is required for actual subsistence in a state of complete rest. If, however, exercise be continued, then, as it appears that the muscles while in action appropriate nitrogen, this nitrogen must either be supplied by the food, or be drawn from some other part of the body. In short, in the absence



of a proper supply of food, the active muscles feed upon those parts which are less actively employed, or which are less capable of resisting the depredation. In this way, the heart is apt to suffer; it is itself in constant action, and therefore requires a large supply of nitrogen, which supply is diminished if the voluntary muscles are thrown severely into play without sufficient provision being made by increased food. It is thus evident that an increase of nitrogen is necessary in direct proportion to the increase of work; but the energy necessary for the work is certainly not wholly, nor even mainly, derived from the nitrogenous matter. It is quite true that the body is able to use nitrogenous matter in this way, but generally this is on compulsion, as it were, and when no other material has been supplied; but the loss of force under these circumstances is so great that the system soon becomes exhausted. It is, therefore, necessary to supply material which is easily oxidised, and capable of rapidly yielding up its potential energy under the influence of the changes wrought upon it in the lungs and circulation. This material is supplied in the fat and carbo-hydrates of which I have already spoken. Weight for weight, the fat has about  $2\frac{1}{2}$  times the potential energy of the carbo-hydrates, but it is doubtful if it could be used alone in their stead. In the Arctic regions it appears to be capable of being used in this way to a very great extent; but in temperate and tropical climates it does not appear capable of entirely replacing starch. A practical proof of this was given me by an Officer who served in the Cape, and who told me that on one occasion he formed one of a party of men who for three weeks had nothing but mutton (with, of course, the usual amount of fat) and water. They managed to march on this diet, but their strength gradually gave way, and at the end of the time they were barely able to stand. On the other hand, it is doubtful whether a diet composed of fat-free meat, starch, and water, could support life in a state of efficient health. I am not aware of any satisfactory experiments on this point. One difficulty attending such experiments would be that there are few natural starches which are not mixed with other constituents. All the cereals, for instance, contain both nitrogenous and fatty matters. Potatoes and rice probably contain least fat of the natural starchy matters generally obtainable. It would seem, then, on the whole, that we cannot completely replace either starch or fat, and that a considerable quantity of these substances is necessary for health. Further, as the greatest part of the energy necessary for work is due to them, they must be materially increased whenever more work is demanded.

There still remains another class of substances which are essential to health, this is the *salts*, including the sodium chloride chiefly, the potassium chloride, calcium and magnesium phosphates, &c. All these, except the first, are taken entirely in the food, which requires to be sufficiently rich in them to be thoroughly nutritious. The sodium chloride is also present largely in the food, but the requirements of the body necessitate in addition a considerable quantity to be taken in bulk,—and it may be a question whether some of the others might not



also be taken in the same way with advantage. The use of the salts, apart from those such as the calcium and magnesium phosphates which enter into the composition of the tissues, is rather obscure, but one use can be pretty clearly shown, viz., that they materially assist in the oxidation of matters, whether effete or otherwise, and therefore play an important part in the animal economy. Wherever, then, increased energy is demanded, calling for, of course, increased oxidation, a considerable increase of salts must accompany the additional food. Part of this will of course be supplied in the food itself, whilst part must be added in bulk, chiefly the sodium chloride, but perhaps also some of the others, as the potassium chloride, &c.

The point now to be considered is: How much food ought to be supplied? To answer this we must refer to some of the recent experiments which have been made to calculate out the potential energy obtainable from different kinds of food. This is generally stated as so many foot-tons, that is, as equal to so many tons raised through one foot. There are various ways of expressing it, but we may adopt this one as being very generally used and easily understood. It being possible then to calculate how much energy is obtainable from each substance, what we require to know, in order to apportion diet to exercise, is the amount of force required. Now, we can calculate pretty correctly the amount of work done by an individual, and we can also (from Professor Haughton's ingenious researches) ascertain the force expended by the involuntary work of the body, such as the heart's action, &c.,—but there still remains a quantity more difficult to estimate, viz., that required for the evolution of the animal heat and other processes in the system. We can, however, arrive at this experimentally by finding the amount of food which will keep a man alive at rest, considering this as the minimum, and also the amount which will keep him in health at average work. To this latter we can then add proportionately for excessive work. The subsistence diet for a man at rest, calculated from Frankland's figures (Parkes's Hygiene, p. 170), is the following:—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 138 grains | } Equal in potential<br>energy to about<br>2,330 foot-tons. |
| Carbon .....  | 3,030 „    |   |
| Salts .....   | 219 „      |   |

Now, as the work of the heart, &c., has been calculated at about 260 foot-tons, there would remain 2,070 as absolutely required for the animal heat and other processes at the lowest calculation. But this must be materially increased with every increase of exertion, for the heart works more rapidly, the circulation moves quicker, the chemical changes go on at a greater rate, and more animal heat is wasted. Accordingly we find that the standard average diet for a man at work is as follows:—

|               |              |   |
|---------------|--------------|---|
| Nitrogen..... | 316.5 grains | } Equal to about 3,833<br>foot-tons of poten-<br>tial energy. |
| Carbon .....  | 4862.0 „     |   |
| Salts .....   | 461.0 „      |   |

If now we consider that a man on this diet is doing a good day's work,



equal to 300 foot-tons, and add to this 260 for the internal mechanical work, we have remaining for the animal heat, &c., 3,273, or an increase over the subsistence-diet of 1,200. It would therefore seem as if for every foot-ton of external work, we ought to add in addition about four more for the internal processes, or we must supply five times the potential energy as food that we expect to obtain as labour. Even this calculation, however, is short of the mark, for we find that the amount increases at a greater rate as the work advances. For a man doing laborious work, that is, equal to about 450 tons per diem, the following is the mean calculated diet:—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 450 grains | } Equal in potential<br>energy to about<br>4,784 foot-tons. |
| Carbon .....  | 6,242 „    |   |
| Salts .....   | 580 „      |   |

Or an increase of 1,049 potential tons to provide for the additional 150 tons of productive labour; here the increase is seven times instead of five,—so that the addition required as work increases is almost in a geometrical instead of an arithmetical ratio. Let us now examine the diets issued to soldiers, and compare them with the above standards. The ordinary diet of the English soldier at home is the following (as calculated by Dr. Parkes):—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 266 grains | } Equal in potential<br>energy to about<br>3,640 foot-tons. |
| Carbon .....  | 4,718 „    |   |
| Salts .....   | 354 „      |   |

In this diet the carbon is about sufficient, but the nitrogen is much too small, and the salts are also deficient in quantity. It is right to mention that Dr. Playfair has calculated out the diet as rather more nutritious, bringing up the energy to 3848·5 tons. I cannot help thinking, however, that there has been some difference in the mode of estimate, and that Dr. Playfair has calculated the ration of meat as *without* bone, whereas it is really reckoned including bone. Adopting, then, Dr. Parkes's calculation, we find that the above diet is much below the average of a working-man's standard, and that it is a diet in short on which we could not demand more than a very moderate day's work, say 150 to 200 tons. It is true that in time of peace the soldier's duties are not so arduous as those of the majority of labourers, but still the above diet is insufficient to keep him as he ought to be kept, in the highest state of health. Were the meat ration to be increased, as was at one time proposed, from 12 to 16 ozs., including bone, the diet would then stand thus—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 303 grains | } Equal in potential<br>energy to about<br>3,838 foot-tons. |
| Carbon .....  | 4,948 „    |   |
| Salts .....   | 379 „      |   |

The salts would still be rather low, but the diet on the whole would be a fair one, sufficient for average work of from 250 to 300 tons—not by any means an excessive estimate, seeing that a march of ten miles in heavy marching order is alone equal to 250 tons. When, however, troops come into the field much more is demanded of them, and the



diet ought to be arranged accordingly. We have to bear in mind that not only is there more actual work, more waste of tissue, bodily and mental, but that also the food is in many cases not so good in quality, and, therefore, incapable of yielding the same amount of potential energy. A war-diet ought to provide for a minimum work of 350 to 400 tons, and be capable of being increased at the shortest notice to 500 tons or more, as circumstances call for it. Such a state of things would be met by a diet of the following proportions:—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 350 grains | } Equal in potential<br>energy to about<br>4,280 foot-tons. |
| Carbon .....  | 5,500 „    |   |
| Salts .....   | 450 „      |   |

To be increased as circumstances demanded to—

|               |            |   |
|---------------|------------|---|
| Nitrogen..... | 450 grains | } Equal in potential<br>energy to about<br>5,000 foot-tons. |
| Carbon .....  | 6,500 „    |   |
| Salts .....   | 500 „      |   |

Now, in scarcely any instance has a war-ration reached this amount. In the Crimea in our own Army the ration *nominally* came to about 272 to 290 grs. of nitrogen, about 4,400 to 5,000 of carbon, and about 280 to 320 of salts; but it was only late in the campaign that this ration was really issued. It will be but too well remembered by those who passed through the first year of that memorable war, how miserably deficient the ration really was. Our own errors and misfortunes at that time have, however, been fully criticised and exposed, and I should fear to weary you unnecessarily by going over the same ground again. But it is only comparatively recently that a full account of the experiences of our allies has been published in the two great works of Dr. Chenu, viz., the Reports on the Crimean and Italian Wars, the latter work containing in an appendix many documents referring to the former campaign. From this we find that the ration in February, 1856, consisted of the following:—

|         |    |             |   |              |                          |
|---------|----|-------------|---|--------------|--------------------------|
| Bread.. | .. | 750 grammes | = | 26·50 ounces | } Total 41·04<br>ounces. |
| Meat..  | .. | 300 „       | = | 10·60 „      |                          |
| Rice .. | .. | 60 „        | = | 2·12 „       |                          |
| Sugar   | .. | 20 „        | = | ·70 „        |                          |
| Coffee  | .. | 16 „        | = | ·56 „        |                          |
| Salt .. | .. | 16 „        | = | ·56 „        |                          |

Fresh meat was distributed four times in ten days, salt meat (250 grammes = 8·8 ounces) on three days, and preserved meat on three days. If biscuit was issued, 550 grammes (= 19·4 ounces) were given. An *occasional* extra ration was issued, according to circumstances, of—

|            |                     |   |             |                     |
|------------|---------------------|---|-------------|---------------------|
| Biscuit .. | 100 grammes         | = | 3·6 ounces. |                     |
| Wine ..    | $\frac{1}{4}$ litre | = | 8·8 „       | three times a week. |
| Brandy ..  | $\frac{1}{8}$ „     | = | 2·2 „       | four times a week.  |



This was equivalent to the following :—

|            |    |            |  |
|------------|----|------------|--|
| Nitrogen.. | .. | 263 grains | } Equal in potential energy<br>to about 3,348 foot-<br>tons. |
| Carbon ..  | .. | 4327 „     |  |
| Salts ..   | .. | 472 „      |  |

The additional ration when issued would add about 78 grains of nitrogen, 660 of carbon, and 26·6 of salts, and of potential energy about 400 tons. It is obvious from what has gone before that such a diet was totally inadequate to support men on active service. It is true that additional rations might be issued “à titre de remboursement,” but the pay of the French soldier is very small, and he could hardly have added much to his diet in that way. Besides this, I am afraid that even this insufficient diet existed chiefly on paper, for from the information I could myself gather in conversing with French Officers, it would seem that fresh meat was not as a rule distributed anything like so often as four times in ten days. The insufficiency of this diet was fully recognized and protested against by the Medical Officers, whose remonstrances were, unfortunately, too often disregarded.

In the rations of the Prussian, Austrian, and Russian Armies, the same error seems to prevail as in the French and English, viz., a deficiency of nitrogen and a too great preponderance of starchy matters, a diet, in short, insufficient to preserve men in health during active work.

I have gone in some detail into the *quantity* of food, let me now say a few words as to the *quality* and *kind* of food required. If it be necessary to supply a sufficient amount of food to yield energy adequate for the work required, it is not less essential that the food should be properly proportioned and sufficiently varied. An apparently sufficient amount of energy would be obtained by *calculation* from a diet consisting of pure starch and pure albumen, but such a diet would be practically useless, for it could not long sustain life. There are four essential divisions into which the food requires to be separated, viz., albuminates or nitrogenous substances, fats, starchy or saccharine substances, and salts, and these ought to be in something of the following ratio :—

|                              |    |    |    |    |    |
|------------------------------|----|----|----|----|----|
| Albuminates                  | .. | .. | .. | .. | 10 |
| Fats                         | .. | .. | .. | .. | 6  |
| Starches (or carbo-hydrates) | .. | .. | .. | .. | 30 |
| Salts                        | .. | .. | .. | .. | 2  |

These are taken in their proportions when thoroughly dried, all the water being completely driven off. Now in the soldier's diet generally there are the following fundamental errors :—

- The albuminates are *deficient*.
- The fats are *very deficient*.
- The starches are *somewhat in excess*.
- The salts are *rather deficient*.

Another important error (now somewhat rectified) is the great same-



ness of the diet. Monotony of diet soon causes the food to pall, the appetite is diminished, and the health suffers. The great enemy that armies have to contend with is scurvy; but for the scorbutic taint it would be comparatively easy to deal with the other causes of disease. Even cholera would lose half its terrors in presence of a thoroughly well-fed body of men. We are still very much in the dark as to what the nature of scurvy is, but we know a good deal empirically of the ways in which it is induced; the following have been ascertained:—

| <i>Scurvy may be induced</i>        | <i>May be cured by the use of</i>                                |
|-------------------------------------|--|
| By deficiency of fresh vegetables.  | Fresh vegetables, lime-juice, vinegar, salts of vegetable acids, |
| „ of nitrogenous food.              | increased nitrogenous food,                                      |
| Probably also by deficiency of fat. | variety of diet.   |
| By mere sameness of diet.           |  |

The effects of want of vegetables, and the beneficial results from the use of lime-juice, are well known. With regard to the effects of deficient nitrogenous food, various cases are on record, one of the most striking being that of the Perth Penitentiary, as recorded by Professor Christison. Scurvy there came on in consequence of a ration of molasses being substituted for milk from motives of economy. On the milk being restored, the scurvy rapidly disappeared. It is true that here there were salts also concerned, for milk contains them in large quantities. Still I think it may safely be said that scurvy is likely to follow any material or prolonged disturbance of the equilibrium, which ought to be maintained between the different articles composing a diet, and that even with this equilibrium kept up, mere sameness of diet will after a time induce it. Once it is set up in a body of men, the most disastrous consequences follow—dysentery, diarrhoea, typhus, rheumatism, ulcers, &c., are sure to break out, and it besides leaves the system totally unfitted to resist any epidemic poison that may present itself upon the scene, so that cholera and typhoid fever find easy victims. To see the truth of these remarks we have only to look at the history of many campaigns. Scurvy seems to be everywhere, accompanied or closely followed by dysentery and typhus. We shall not be surprised when we bear in mind that the two main causes of these diseases are bad and insufficient diet and crowding, two causes which have almost always been but too generally present in wars. If there is more or less starvation without crowding, fever will always follow, but it is a fever of the relapsing type, and of itself rarely fatal; it, however, weakens the system extremely, and lays it open to attacks of other diseases. But if to starvation we add crowding, then typhus is inevitable.

Now, it is almost impossible, from the nature of things, to avoid crowding in war, as an army must necessarily occupy a smaller proportionate space than the most crowded city. In the Report of the Royal Commission of 1857, some calculations are given on this point. In East London, the most densely populated part of the kingdom, the number of persons per square mile is 175,816. To provide even the amount of space which this represents, we should have to give



300 square yards to each tent; but the area allowed is only 145 square yards, representing about 320,000 men per square mile. In some cases only 50 square yards have been given, representing 930,000 men per square mile, and it has not unfrequently happened that the tents have been pitched as close as they could stand, giving some 22 or 23 square yards for each, or representing about 2,000,000 persons per square mile, supposing that each accommodated only 15 men. Such a condition of matters is bad enough, but if to this we add food, both insufficient in quantity and bad in quality, what can we look for but all the long train of fatal diseases, which have too often decimated, and sometimes annihilated armies? Perhaps the most notable recent illustration occurred in the French Army, during the winter and spring following the taking of Sebastopol. As may be remembered, the French arrangements were somewhat better than ours at first, and they did not suffer during the first winter to so great an extent as we did, but during the second winter the conditions were reversed. Wise by experience, no efforts were spared by our administration to provide proper food and shelter for the troops, and the errors of the first winter,—less the faults of individuals than the inevitable results of an obsolete system, which a long peace had given no opportunity of correcting,—were most nobly repaired. The result was one of the most healthy armies ever known. The sick list was reduced in many cases below 1 *per cent.*, whilst whole battalions were often without a single man unfit for duty. On the other hand, the rations of the French soldier, far from improving, appeared rather to deteriorate, whilst crowding increased with the inclemency of the weather, and personal cleanliness was naturally much neglected. The medical Officers foresaw what would be the result, and strongly urged immediate measures to be taken. As early as April, 1855, Dr. Levy warned the French authorities of the threatening dangers of typhus and dysentery in an epidemic form. In November, 1855, Dr. Baudens, Inspector-General, addressed a letter to the Minister of War, pointing out the insufficiency of the soldiers' diet, the want of fresh vegetables, &c., all tending to produce scurvy, and strongly enjoining the immediate issue of preserved vegetables, condiments, &c. He also called attention to the wretched tent accommodation, and the miserable clothing that the men had to put up with. That these prognostications were but too true is seen by the subsequent letters and reports:—

On the 8th of February, 1856, he writes, "Typhus threatens to assume the proportions of a great epidemic." On the 11th, the number of cases is still increasing, but with the significant fact that as yet no officer (generally well fed and sheltered) had been attacked. By the 28th, fresh cases, at the rate of 150 to 200 per day, were declaring themselves, and several medical Officers had already perished. The rapid increase may be conceived by the following abstract of the total cases and deaths, both in the Crimea and at Constantinople:—

|                |       | Cases. | Deaths. |
|----------------|-------|--------|---------|
| November, 1855 | .. .. | 16     | 8       |
| December    ,, | .. .. | 775    | 332     |



|               |    | Cases. | Deaths. |
|---------------|----|--------|---------|
| January, 1856 | .. | 3185   | 1129    |
| February „    | .. | 7834   | 4339    |

And a most instructive table is added, comparing the French and English forces during February, 1856 :—

FRENCH ARMY (strength 132,000 men).

|                                 | Admitted. | Per cent.<br>of strength. | Died. | Per cent.<br>of strength. |
|---------------------------------|-----------|---------------------------|-------|---------------------------|
| Wounded and general patients .. | 11,732    | 8·8                       | 1,190 | 0·9                       |
| Typhus cases .....              | 7,834     | 5·8                       | 4,339 | 3·3                       |
| Scorbutic, &c. ....             | 6,772     | 5·1                       | 349   | ·26                       |
| Total .....                     | 26,338    | 19·7                      | 5,878 | 4·46                      |

ENGLISH ARMY (strength 70,000 men).

|                                 | Admitted. | Per cent.<br>of strength. | Died. | Per cent.<br>of strength. |
|---------------------------------|-----------|---------------------------|-------|---------------------------|
| Wounded and general patients .. | 3,984     | 5·7                       | 43    | ·08                       |
| Typhus .....                    | 0         | 0                         | 0     | 0                         |
| Scorbutic, &c. ....             | 34        | ·05                       | 0     | 0                         |
| Total .....                     | 4,018     | 5·75                      | 43    | ·08                       |

The death-rate in this ratio would amount in the French Army in one year to 58 per cent., or more than half the force, and this without much severe work, for the fighting was practically over, and the wounded trifling in number. On the other hand the English death-rate would have only been about 1 per cent. per annum, or little over that of the most healthy classes of the civil population. Altogether in the first four months of 1856, the French Army lost from typhus alone about 4,000 in the Crimea, and as many more at Constantinople, including about 40 or 50 medical officers. As regards the losses at Constantinople, these were hurried on and intensified by the crowding of the hospitals, consequent on the increased arrivals of sick from the Crimea. On the 1st of January, 1856, with 869 sick in the Daoud Pasha Hospital, Dr. Garreau reports the sanitary condition to be fairly good. On the 28th of the same month, there were 1,140 sick; from that day dates the rapid increase of typhus, for want of room had rendered it necessary to bring the beds closer together, and so crowd the wards. In short the state of things induced, was exactly parallel to that which prevailed in our own hospitals at Scutari, just one year before.



That we were enabled to show so marked a contrast in the second year was due to two main causes: 1st. To the free circulation at home of the actual truth, and the consequent rousing of public opinion to insist upon adequate measures of relief being adopted; and 2nd. To the fact that the medical department of our Army was an independent body, communicating directly, through its own head, with the Commander-in-Chief. In the French service, on the other hand, where the pernicious system of Intendance prevails, all representations and suggestions have to be filtered through the Intendant-General and his subordinates, the independence of the medical Officer is destroyed, and his spirit crushed. It is true that a right of appeal exists from the Intendant to the General Commanding, but considering that all proposals of promotion or advancement in the Department are made by the Military Intendant, I leave it to the judgment of my hearers to infer how many appeals are likely to be made? It is greatly to be hoped that this evil system will, ere long, be abandoned in France, and the Medical Department placed on a similar footing to that of Prussia.

In criticising the diet usually issued to troops in war, I have not referred much to the individual details. I now wish to say a few words on that point. As Dr. Scriver says in one of his reports—"War rations form a coarse diet, which ere long fatigues the stomachs of the most robust." Even if they were given in sufficient abundance, their sameness and monotony are highly objectionable.

1. *Nitrogen.* A ration of a pound of meat, including bone, would probably be sufficient—provided that fresh and preserved meat were issued as often as possible, and salted meat as rarely as possible. Beef and mutton should be made to alternate as much as can be managed. As one pound of meat, however, would not yield enough of nitrogen alone, a small ration of cheese might be advantageously added, as well as a certain quantity of peas or beans—to be increased as extra work demanded.

2. *Fat.* This has always been deficient, and yet it is one of the most important articles for hard-working men. Indeed a mere increase of fat alone would often be sufficient in cases of extra work. Under any circumstances, a ration of bacon-fat or butter should be issued. It would be a good thing if the use of oil could be introduced into our Army; it is extremely wholesome and palatable, and I believe any prejudice against it would soon be got rid of.

3. *Starch or Carbo-Hydrates.* This ingredient has always been rather in excess in the diet—at least in comparison to other articles; it would be better to diminish it a little, if fat were substituted instead, the potential energy of the latter being as 2·4 to 1 of the former. The best form is fresh bread, which ought always to be used instead of biscuit, when it can possibly be obtained. Potatoes and rice are also exceedingly good forms.

4. *Salts.* These have generally been rather deficient. In addition to the common salt used in bulk, it might be well to add potassium chloride, &c., in small quantities, should there be any difficulty about a supply of fresh vegetables—but it is by these that we ought to



endeavour to introduce them. No effort should be wanting to procure regular supplies of vegetables, either fresh or preserved, as the best safeguard against scurvy. Another article of great value, but much neglected in our Army, is *vinegar*, which should always be freely used in a campaign. It would be an excellent plan to get the soldiers to make salads with oil and vinegar, as a means of introducing both fat and salts into the system. For a salad it is not necessary to have carefully-culled lettuce, or blanched endive, or other garden refinements,—a very excellent salad can be made of many ordinary wild plants; dandelions, for instance, or any vegetables boiled and used cold, such as cabbage, brocoli, carrots, lentils, peas, beans, potatoes,—in short, almost anything that can be digested by the human stomach.

5. *Condiments*. These are of great importance. Mustard and pepper should always be issued, and, if possible, other spices as well. The judicious use of condiments makes all the difference between a grateful and appetising dish and an insipid and repulsive mess.

6. *Beverages*. Unquestionably the best beverages to work on, are *tea*, *coffee*, or *cocoa*, and these should be supplied without stint, and with plenty of sugar to sweeten them. Of course milk cannot be always looked for in a campaign, but when procurable ought to be issued, either fresh or preserved. As to the vexed question of alcohol, I am of opinion that the *spirit* ration is a mistake; but I think that a moderate ration of good *beer* or *red wine* would be beneficial. *Spirits* should never be issued, except on very special occasions, and then only on the recommendation or with the approval of the medical officer.

Tobacco is a substance that should also be supplied in moderation, as I believe most men are the better for a little of it, although, like alcohol, many can do without it altogether. In cases of extreme fatigue, I think great benefit would be derived from a liberal use of Liebig's Extractum Carnis. I know of nothing which so rapidly recruits the exhausted frame. It can be prepared in no longer time than is necessary to get water heated, or it may be taken, less advantageously it is true, cold. But I can conceive no more useful thing than a cup of the *tea* made from it, issued to men going on trench or picket duty on a cold wet night, or starting on a toilsome march. I believe it would do more than anything else towards keeping up their strength and spirits. Similarly, on coming off heavy duty, cold and weary, often too fatigued to sleep, a cup of it would be exactly what would be wanted to restore the balance of the disturbed and exhausted frame.

To sum up then, I would propose as a war-ration some such diet as the following, to be varied as much and as frequently as the ingenuity or opportunity of the commissariat can devise, or as the skill of the cook can accomplish:—



## PROPOSED RATION IN TIME OF WAR.

|   | Gross weight. | Water. | Albuminates. | Fat. | Carbo-hydrates. | Salts. |                          |
|---|---------------|--------|--------------|------|-----------------|--------|--------------------------|
|   | oz.           | oz.    | oz.          | oz.  | oz.             | oz.    |                          |
| Meat, 1 lb., less }<br>bone, say..... } | 12·8          | 9·6    | 1·9          | 1·1  | ...             | 0·2    |                          |
| Bread .....                             | 20·0          | 8·0    | 1·6          | 0·3  | 5·9             | 0·3    |                          |
| Potatoes .....                          | 16·0          | 11·8   | 0·2          | ...  | 3·7             | 0·2    |                          |
| Vegetables .....                        | 4·0           | 3·4    | ...          | ...  | 0·3             | 0·03   |                          |
| (as carrots)                            |               |        |              |      |                 |        |                          |
| Peas or Beans....                       | 3·0           | 0·4    | 0·7          | 0·1  | 1·6             | 0·1    |                          |
| Cheese .....                            | 2·0           | 0·7    | 0·7          | 0·5  | ...             | 0·1    |                          |
| Bacon-fat, oil, or }<br>butter .....    | 2·0           | 0·1    | ...          | 1·8  | ...             | ....   |                          |
| Sugar .....                             | 2·0           | 0·1    | ...          | ...  | 1·9             | ....   |                          |
| Salt .....                              | 0·5           | ...    | ...          | ...  | ...             | 0·5    |                          |
| Vinegar .....                           | 2·0           | 1·9    | ...          | ...  | ...             | 0·1    |                          |
| Condiments .....                        | as required   | ....   | ...          | ...  | ...             | ....   |                          |
| Tea .....                               | 0·5           | ....   | ...          | ...  | ...             | ....   |                          |
| or                                      |               |        |              |      |                 |        |                          |
| Coffee .....                            | 2·0           | ....   | ...          | ...  | ...             | ....   |                          |
| or                                      |               |        |              |      |                 |        |                          |
| Cocoa .....                             | 2·0           | ?      | 0·3          | 1·0  | 0·5             | ....   | {and 1 oz.<br>of alcohol |
| Beer .....                              | 20·0          | 17·8   | ...          | ...  | 1·2             | 0·1    |                          |
| or                                      |               |        |              |      |                 |        |                          |
| Wine (red) .....                        | 10·0          | 8·9    | ...          | ...  | ...             | 0·1    | Ditto.                   |
| Totals ....                             | 86·3          | 53·8   | 5·7          | 4·8  | 15·2            | 1·8    | 1                        |
|   | to            | to     | to           | to   | to              |        |                          |
|   | 74·8          | 44·9   | 5·4          | 3·8  | 14·0            |        |                          |

This would give of nitrogen, carbon, and salts, about:

|              |                   |   |
|--------------|-------------------|---|
| Nitrogen.... | 375 to 390 grains | } equal in potential energy<br>to from about 4,800 to<br>5,300 foot tons. |
| *Carbon .... | 5300 to 5930 „    |   |
| Salts .....  | 780               |   |

Such a diet would, if properly varied, be amply sufficient for the ordinary fatigues of war, and might be easily supplemented in cases of extreme exertion. Could such a diet have been regularly supplied during the Crimean campaign, the horrors of the first winter would have been in a great measure spared us, and the ultimate gain, even at a great apparent immediate outlay, would have been enormous in a mere monetary point of view. Of course we should still have had our losses by the enemy's fire, but these are always trifling in comparison with the ravages of disease; besides which, in a truly hygienic force, but few of the wounded ought to die. Disease is the real enemy to dread, and the best weapon to fight him with, is good, abundant, and varied food; this given, our soldiers will easily contend with aught

\* Not including the alcohol.



else. It may serve to illustrate what I have said if I state shortly the comparative losses by disease and actual wounds in action at different times.

*Crimea. English Army.*

|                                |        |
|--------------------------------|--------|
| Killed and died of wounds..... | 4,602  |
| Died of disease .....          | 17,580 |
| Total .....                    | 22,182 |

The admissions into hospital from wounds, amounted to only 11 per cent., and from disease to 89 per cent.

In February, 1855, at Scutari, the deaths to admissions were at the rate of 467 per 1,000.

In the *first seven months* of the war the mortality was at the rate of 600 per 1,000 per annum.

In the *last five months*, under a hygienic régime, the deaths were at the rate of 11 per 1,000 per annum.

*Peninsula.*

During the last three years ending in 1814, the sick and wounded amounted to 22·5 per cent. of the strength, thus distributed:—

|               |      |
|---------------|------|
| Wounded ..... | 1·5  |
| Sick .....    | 21·0 |
| Total .....   | 22·5 |

In the French Army in the Crimea:—

During the *first winter* (November, 1855, to April, 1855), a period of hostilities giving 8,000 wounded, there were 90,000 sick and 11,000 deaths.

During the *second winter* (November, 1855, to April, 1856), a period of hardly any hostilities, giving only 323 wounded, there were 107,000 sick, and 21,000 deaths, of which 10,000 were from typhus.

In contrast to these, we have the examples of two campaigns, short certainly, but in hot countries, and at an immense distance from our resources, which show very different results, viz., those in China and in Abyssinia. In China, during the period of active hostilities, the following were the ratios of deaths:—

|  |       |
|--|-------|
| Total deaths per 1,000 .....               | 65·54 |
| Of these were killed and died of wounds .. | 12·66 |

The greater part of the mortality was due to cholera, diarrhœa, and dysentery; but scurvy and typhus were absent.

Again, in Abyssinia, a country quite within the tropics, the results of the campaign were the following:—

|  |      |
|--|------|
| Total deaths per 1,000.....                    | 13·0 |
| No deaths from action.                         | —    |
| Total sick admitted into hospital per 1,000 .. | 49·8 |



The health of the troops would have been much better but for the break down of the transport, and the consequent reduction of the rations to mere bread and beef, instead of the excellent and varied diet originally intended.

The happy results—although still falling short of what we should aim at—following the employment of true hygienic measures in these two short campaigns, as well as the wonderfully healthy condition of our Army in the latter part of the Crimean campaign, are highly encouraging, and prove on what sound principles the rules of hygiene are based. Let us only hope that these lessons may not be lost, and that should unhappily the necessity arise for putting to the test again the experience we have so dearly bought, we may not be found trying “how not to do it.”







For Review of this Art. see the British Medical Journal  
 of 1874 -

Notes on the Health Service of Armies during War.—  
 By Deputy Surgeon-General CHARLES ALEXANDER GORDON,  
 M.D., C.B.

I SELECT the term "Health Service" intentionally. It is in a measure our equivalent of the French "Service de Santé," and certainly more nearly represents the functions of a so-called medical department than anything else in common use, inasmuch as not only have the members of that service to practise medicine as part of their ordinary duties, but also surgery, often midwifery, among the families of soldiers and officers, and by no means seldom pharmacy. The great object of the service, however, is to preserve health. To recover it in the cases of those who have lost it, whether by sickness or by wounds, is doubtless a great and important mission, but for all military purposes the primary object is to preserve health and consequent efficiency among the troops. "The Health Service" of our army is therefore, in my view, the correct designation to apply to the department the principal duty of which is the preservation and restoration of health.

In the following remarks I endeavour to bring before the reader such particulars in regard to this branch in connection with some armies, as I have been able to obtain reference to. I am aware that in several points my information is far less complete than I could wish. It is by no means an easy task, however, to obtain details, and therefore I present my sketch as it is, in the hope of the palpable gaps in it being hereafter filled up by some other writer who, like myself, endeavours to seek for information from "our neighbours."

RUSSIA.

The direction of the army sanitary service forms a special department under the ministry of war presided over by a medical director, namely, the surgeon-general. He distributes and recommends for promotion all below him except the medical officers of the service,

*ma*



who are really advanced by their military superiors, although nominally on the recommendation of their departmental head.

The duties of the surgeon in hospital until lately included the treatment of the sick and wounded, the distribution of patients and internal arrangements of the wards; but the general arrangements of the establishment were conducted by a committee composed of an intendant, a surgeon, and a steward.

There are two classes of medical officers, namely, staff and regimental. The latter treat the slighter cases in the regimental infirmaries, where such an establishment exists. Severe cases are, however, sent to a military or civil hospital, where, although the patients may be visited by the regimental surgeon, he is permitted to have no voice in their treatment.

There are six medical grades, namely, 1, comprising the director of the department, the surgeons-general of armies, with the relative ranks of lieutenant-general and major-general; 2, surgeon-general of the body-guard, principal surgeons of military schools and of military hospitals of the sixth class, with the rank of major-general and brigadier-general; 3, surgeon-general of the cavalry of the second guard, surgeons-general of the corps of grenadiers, and of corps d'armée, principal surgeons of hospitals of the fourth and fifth class, with the rank of colonel; 4, surgeons of divisions, surgeons of hospitals of the third, second, and first class; surgeons, en second, of hospitals of the sixth, fifth, and fourth class; surgeons-major of corps of cadets, with relative rank of colonel and lieutenant-colonel; 5, surgeons-major of all regiments of infantry and cavalry of the guard, surgeons-major of batteries of artillery, of battalions of chasseurs, sappers and pontoniers of military schools, arsenals, and to hospitals in the capacity of *medecin traitant*, with the relative rank of lieutenant-colonel and major; 6, or junior class assistant-surgeons attached to battalions of the guard and line, to military schools, corps of cadets, and military hospitals, with the relative grade of captain, and, after five years, of major.

Medical officers of the army become eligible for honorary titles; thus, those of the first class have the title of excellency, and are admitted into the order of hereditary nobles, that is, receive peerages. Promotion takes place among the inferior grades usually by seniority, but by selection among the higher; retirement is permissible after twenty-five years' service, and after thirty-five years' full-pay service a medical officer becomes entitled to full-pay retirement. While serving, an increase of pay is granted at the end of every period of five years they may have passed in the same grade.

In time of war each corps-d'armée and each division has its own chief medical officer. The divisional chef has charge of the divisional field-hospitals; when two such establishments unite to form a temporary hospital, the senior of the two then taking command. On



service the sick and wounded are treated in five different kinds of hospitals, viz. the military lazarets, the mobile lazarets of divisions, the movable hospitals, the temporary hospitals, and the permanent stationary hospital. In times of peace regimental hospitals are formed under certain circumstances, as where the larger military hospitals do not exist, or, if existing, have not sufficient accommodation. The military lazarets are formed by the establishments with regiments. Such portions of them as are adapted for service are united so as to form the mobile divisional lazarets, the surplus being left in store. The functions of such establishments include, first, help to the sick on the line of march, and then transport to a hospital or divisional lazaret. During a siege, in a permanent camp, or with a detachment, they may, if necessary, be transformed into temporary hospitals.

The moveable divisional hospitals, formed by the fusion of the previous kinds, afford care to the sick and wounded during military operations, and transport to other hospitals, whether temporary or permanent. When the division is stationary they supply transport for the sick to the more distant establishments. Each lazaret is capable of accommodating 6 officers and 160 soldiers. It also provides for the accommodation of patients in tents, or in buildings requisitioned for the purpose. The tents connected with it are of the American pattern; the ground in the interior is covered with a cloth, and the brancards, provided with iron feet, serve as cots. The train comprises conveyances for the tents, for medical equipment, for food, &c., also for the sick and wounded. The carriages intended for the stores admit of being made available, under pressure, for transport of sick and wounded. The lazaret is under the absolute command of the chief medical officer of the division, its personnel, alike medical and administrative, being subordinate to him. The medical officers treating patients are furnished from regiments. Each regiment provides from one to four infirmiers, and an apothecary is selected from among those of the division.

The complete personnel of a lazaret is comprised as follows, viz.—I. *Medical*.—1 medical officer (chef), 4 surgeons, first class, 4 of second class, 1 apothecary (or dispenser), 8 infirmiers of the first class, 8 of the second class, 1 assistant compounder, in all 28 persons. II. *Administrative*.—1 commissary, 1 bookkeeper, 1 almoner, 1 deacon, 1 secretary, first class, 1 ditto, second class, in all 7 persons. III. *Workmen*.—2 tailors, 3 shoemakers, 2 carpenters, 2 joiners, 2 locksmiths, 2 blacksmiths, 2 under blacksmiths, 2 cartwrights, 2 saddlers, 2 farriers, in all 22 men. IV. *Brancardiers*.—1 commandant, 1 sergeant-major, 4 sous-officers of the first class, 4 of the second class, 200 brancardiers, in all 210 men. V. *Supplementary*.—2 sous officers as storekeepers, and 50 men, including bakers and cooks, in all 52 men. VI. *Train*.—1 officer,



6 sous-officers, 108 soldiers, in all 115 men, or, for all, 16 officers and 417 soldiers. There are 215 draft horses and 8 led horses. All the medical officers are also mounted. Thus the divisional establishment is complete in itself, and directly under the command of the medical chef.

The moveable hospitals are formed, whenever circumstances require, by the union of two or more divisional lazarets, and when established their functions are the same as the former. The temporary hospitals follow the army. Their number is determined by the strength of the force, they and the permanent establishments being capable of providing for one in eight of that strength; each temporary hospital is intended to accommodate 30 officers and 600 soldiers. The usual means of shelter provided in these establishments are huts; they are generally administered on the same principle as the permanent hospitals, but under some circumstances the medical and financial branches are conducted separately, the medical chef in such a case only superintending the former. These hospitals, placed at intervals, are connected with each other by the regular means of transport, and are so arranged as to afford temporary shelter to the sick and wounded.

Their personnel consists of—I. *Commandant*. II. *Medical*.—1 Chief medical officer, 3 medical officers traitants of first class, 4 of second class, 6 infirmiers of the first class, 12 of second class, 1 apothecary, 3 assistant apothecaries of first class, and 3 of second class. III. *Administrative*.—1 instructor, 3 commissaries, 1 book-keeper, 1 chief purveyor, 6 secretaries of the first class, 6 of the second, 1 almoner, 1 deacon. IV. *Superintendents of Wards*.—12 infirmiers, first class, 36 of second class, 96 auxiliary infirmiers. V. *Discipline*.—1 sergeant-major, 1 storekeeper for effects of patients, 1 other for hospital stores, 1 sous officer in charge of the punishments, 1 superintendent of the wash-house. VI. *Workmen*.—6 tailors, 6 shoemakers, 3 millers, 3 carpenters, 3 locksmiths, 3 wheelwrights, 3 blacksmiths, 3 saddlers, 3 farriers. VII. *Train*.—3 sous officers, first class, 3 of second class, 54 soldiers. In all, 22 officers, 285 sous-officers and soldiers, besides 27 conveyances, 108 draft horses, and 6 led horses. Like the moveable divisional hospital, the present establishment forms a unit in itself. It is under the command of a military officer, although, it is added, Russia will probably soon follow the example of Prussia and Italy in abolishing this anomaly and giving the medical officers all power over it.

*Permanent Sedentary Hospitals*.—Preparatory to a war the minister determines what hospitals shall be at the disposal of the chief medical officer of the army, and circumstances are held to decide not only the number of those to be selected, but also how far the several establishments, civil and military, shall be so utilised, with reference to the field of military operations.



In reviewing the ambulance establishments of the Russian army, its personnel is found not only to be more complete than the French, but even than the Prussian. The moveable divisional lazarets in the Russian service, together with the four temporary hospitals which are connected with the corps d'armée, comprise in all 58 medical officers, 8 officers, 2094 soldiers, to whom are to be added 200 labourers, making a total of 2360. There are also 150 conveyances of 4 horses, 16 of 2, or in all 166 conveyances and 660 horses. The extent of those establishments strikes us as wondrous, and yet the requirements of modern war render it necessary.

During an action the principal medical officer details a sufficient number of regimental medical officers for the mobile field hospitals. The carriages belonging to regiments and to the field hospitals unite in conveying wounded to the latter, and both sets of orderlies are similarly occupied. Further in rear of the army are the temporary hospitals, their number alone depending upon the requirements of the sick, as already observed. They are usually established in towns and villages, and vary in size according to circumstances, from those capable of accommodating 200 sick to those capable of receiving 650. In times of peace they form part of the establishments attached to the permanent hospitals, the latter being capable of receiving, according to their class, numbers varying from 200 to 1200 patients.

#### AUSTRIA.

The medical service of the army is administered by a director-general of the rank of major-general, he being assisted by a council formed by professors in the school of military medicine. To each army corps there is a principal medical officer, whose duty is to superintend the professional details of the command, and to give professional attendance to the general. In battle he is expected to superintend the attendance upon and disposal of the wounded, but not himself to undertake manual duties in reference to them. The tactical unit being the brigade, the senior of the regimental surgeons in each takes the office of principal medical officer. If during battle the brigade acts independently he makes his own arrangements; if as part of the corps d'armée, he acts under the orders of the medical officer in charge of the whole. There are two sets of medical officers, namely, those unattached to regiments and those attached. The former are appointed to do duty in groups (*compagnies de santé*) in ambulances of corps and in war hospitals; the latter during battle collect in rear of the line of combat, one half at a point sufficiently near to afford first help, while the others, at a still greater distance, are in a position to yield their aid, as in the second line of assistance. Further in their rear are the regular ambulances of the corps, and behind those the war hospitals.



*The detachment sanitaire (Sanitats detachment)* is thus formed. In each company in the infantry a corporal and four men, as a minimum number, are trained during peace to be useful during war as brancardiers, carriers of the field companions, and so on, such as are most proficient being attached to military hospitals during peace. On service, but while a battle is not imminent, these men continue in the ranks, marching at the rear of their respective companies, but wear upon the arm a distinctive brassard. They are only armed with swords; they carry dressings and a water-bottle. On the eve of a battle each company, on the order of the brigadier-general, furnishes two of these trained men and each batallion a corporal; all are placed under the command of an officer selected for the purpose, and the united body form the "Sanitats detachment." During battle one set of the men are appointed as brancardiers for the removal of wounded from the field, another as carriers of bandages, &c., and when the necessity for their employment as such has ceased, they return to their ranks; the detachment is dissolved, to be reconstituted when required.

The brancardiers while searching for wounded proceed in bodies of three; two carry the brancard and its accessories, the third wire splints and other temporary appliances. They remove the severely wounded to the rear or to a place of shelter, and indicate to the more slightly injured the direction to take to the place of succour. Those who carry the dressings accompany the medical officers, their own knapsacks being placed in the regimental light carts. On the line of march their duty is to give assistance to weakly men and to the sick.

The organization of the Compagnies de Santé (Sanitats Truppe) appears to be somewhat similar to our Army Hospital Corps. During peace there are ten such companies united into a distinct corps under the command of an officer and charge of a medical officer; the duties of the latter being to instruct them and to see that the equipment, professional and otherwise, in their charge is properly kept. Men belonging to these companies are distributed among the larger military hospitals. During war the strength is increased, and a dépôt is formed. The following represents the numbers for a corps d'armée:



| Rank and functions.     | Compagnie de Santé. |         | Depôt in war. |
|-------------------------|---------------------|---------|---------------|
|                         | In peace.           | In war. |               |
| Captain . . . .         | 1                   | 1       | 1             |
| Lieutenant . . .        | 1                   | 1       | 1             |
| Sub-lieutenant . .      | 1                   | 2       | 2             |
| Surgeon . . . .         | 1                   | 1       | —             |
| Sergeants-major . .     | 2                   | 2       | 2             |
| Conductors . . . .      | 4                   | 5       | 4             |
| Corporals . . . .       | 6                   | 10      | 8             |
| Chiefs of patrol . .    | 10                  | 20      | 16            |
| Soldiers . . . .        | 60                  | 150     | 100           |
| Trumpeters . . . .      | 1                   | 2       | 1             |
| Carpenters . . . .      | —                   | 5       | 1             |
| Shoemakers . . . .      | —                   | 2       | —             |
| Officers' orderlies . . | 4                   | 5       | 4             |
| Total . . . .           | 91                  | 206     | 140           |

The purpose of the depôt is to supply the active companies with trained men during war. On active service each company with an army corps is divided into ten squads, five of which are attached to the five brigades constituting the corps, the remaining half, each consisting of a corporal, two chiefs of patrol, fifteen soldiers, and four carriages of two horses each, remain at the place of first assistance appointed for the brigade to which they are attached, the carriages being for the transport of the wounded. To each company eight cavalry soldiers are attached during war, their duties being to act as orderlies and communicate necessary information. The entire number of carriages to each amounts to twenty in peace and twenty-six in war, besides others belonging to the train; each waggon for wounded is capable of carrying two lying down, and four sitting up; it is drawn by two horses. The five waggons of four horses are each capable of carrying, upon *matrass* brancards, two wounded men, besides three sitting, or twelve sitting. The former are intended for the conveyance of men from the first to the second line of aid, the latter thence to the ambulance. There are besides four waggons of four horses for the transport of material, baggage of officers, registers, pay chest of the company; one covered carriage of four horses, five heavy waggons of two horses for baggage, and one field forge, in all thirty-six carriages per corps, besides the forge. On the march the companies are charged with the conveyance of sick or weakly men to the hospitals, or with their regiments, as the case may be. The men are, in fact, brancardiers and infirmiers. In the cavalry and artillery, there being no brancardiers attached to either, the removal of the wounded rests altogether with the compagnies de santé, the men and officers of which cannot be employed upon any other duty than that specially appertaining to them.

Besides the depôt company just alluded to for the supply of



personnel, there is for each corps d'armée a reserve for material, namely, the reserve sanitaire du corps (corps-sanitats-reserve). It is placed under the chief surgeon of the corps, and is intended to furnish medicines, instruments, and surgical appliances for the use of the first and second lines of help. This reserve, under the charge of an assistant-surgeon and apothecary, with four soldiers, has two waggons of four horses each for the conveyance of the stores. It follows the compagnies de santé on the march, and during battle remains near the place of help for the wounded.

*The ambulance of the corps*, having its independent organization, is intermediate between the places of dressing and the hospitals in the rear. Each such ambulance is intended to temporarily accommodate 150 patients, and to afford passing help and nourishment to 600 en route. Each corps has its ambulance, which follows it at a great distance, say fifteen or twenty miles, but remains in communication, so as to approach or fall back, according to circumstances. The following is the personnel of each ambulance, namely—

*Administrative.*—1 captain, 2 sergeant-majors, 1 sergeant, 2 corporas, 36 infirmiers.

*Medical.*—1 regimental medical officer, 2 superior and 2 inferior surgeons, and 2 aides hospitallers.

*Guard.*—1 corporal, 12 soldiers.

*Servants.*—6 orderlies for medical officers.

In addition to professional attendance it is charged with the transport of wounded, not only from the place of first help to its own position, but thence to the fixed hospitals in rear, for which purpose its personnel and carriages are as under, namely—

*Personnel.*—1 sergeant-major, 1 sergeant, 2 corporals, 37 soldiers, 1 farrier, 1 saddler.

*Carriages.*—10 of four horses each, and 4 covered; these being intended for the transport of wounded; and in addition, two conveyances provided by the train sanitaire.

*The escadron du train sanitaire* comprises two groups of personnel, namely, that employed with the conveyances in the field of battle, and those connected with the equipages in rear of it. It has no special carriages for the conveyance of wounded; those employed are alike suited for material of the squadron and for wounded. The following represents the composition of the escadron, viz.:



| Designation.                  | Personnel, materiel, and horses. |          |            |        |
|-------------------------------|----------------------------------|----------|------------|--------|
|                               | Corps de santé.                  | Reserve. | Ambulance. | Total. |
| Officer, subaltern . . .      | 1                                | ...      | ...        | 1      |
| Sergeants-major . . .         | 1                                | ...      | 1          | 2      |
| Sergeants . . .               | 1                                | ...      | 1          | 2      |
| Corporals . . .               | 4                                | ...      | 2          | 6      |
| Soldiers . . .                | 59                               | 4        | 37         | 100    |
| Veterinaire . . .             | 1                                | ...      | ...        | 1      |
| Blacksmith . . .              | 1                                | ...      | 1          | 2      |
| Saddlers . . .                | 1                                | ...      | 1          | 2      |
| Officer's orderly . . .       | 1                                | ...      | ...        | 1      |
| Saddle horses . . .           | 11                               | ...      | 5          | 16     |
| Draft horses . . .            | 96                               | 8        | 60         | 164    |
| Reserve horses . . .          | 5                                | ...      | 3          | 8      |
| Waggons of four horses . . .  | 1                                | 2        | 14         | 17     |
| "    two    "    . . .        | 5                                | ...      | 1          | 6      |
| Cart ( <i>chariot</i> ) . . . | ...                              | ...      | 1          | 1      |
| Field forge . . .             | 1                                | ...      | ...        | 1      |

Thus we have (*a*) personnel medical distributed among regiments, and in ambulances; *b*, brancardiers, forming chiefly the detachment sanitaire, and infirmiers the *compagne de santé*; and (*c*) the rolling stock.

Agreeably to the organization of 1870, the direction of the whole is placed under the principal surgeon, the arrangement for the field being divided into two groups, namely, those for the first line, and those connected with the hospitals. The former are appointed per division, and are arranged so as to constitute, during battle, two places of first assistance, one of dressing, one ambulance, and a reserve, the base of the whole being the military base of the division. The principal medical officer has been accorded the power to take under his control civil medical men who appear on the field under the auspices of the red cross. The duties of the intendance are, moreover, limited to carrying out the requirements of the principal medical officers of corps and divisions. The *compagnie de santé* is modified in its organisation. A special detachment of infirmiers is attached to each division, and consists of 2 officers, 1 surgeon-major, 2 surgeons of reserve, 1 sergeant-major comptable, 4 sergeants, 6 corporals, 10 exempts, 68 soldats de santé (infirmiers), 1 soldier of engineers, 5 orderlies for officers; total, 100 men. The rolling stock is composed of 5 covered waggons, 5 carts, and 11 carriages for transport of wounded. The 68 soldiers are divided into four groups; 15 proceed to each of the two places of first help, 30 to the place of dressing, and 8 to the ambulance. The train des équipages furnishes the *compagnie de santé* as may be required, and 4 cavalry men are attached as estafettes.

So long as a battle is not imminent, regimental medical officers remain with their battalions, &c.; when an action is expected, all quit them to repair to a place determined upon and ordered by the



general in command. There are usually two such places determined per division, and should an action take place these are the points where first help will be available for the wounded. Each regimental medical officer proceeding to the divisional rendezvous, is attended by two orderlies carrying dressings; the section de santé of the division sends fifteen infirmiers-brancardiers with a cavalry estafette, and four carriages of two horses for the transport of the wounded. The senior on the spot assumes the direction. It is the duty of the brancardiers to bring from the point to that spot all wounded who are unable to walk, returning under fire as quickly as possible, after having deposited each successive one, *and without respect* to nationality. If the distance becomes considerable, the brancardiers are formed into two groups, one to bring the wounded half way, the other to carry them to the place of assistance. Such medical officers as may be required to do so repair to the place of dressing, the carriages being always retained in readiness at the former, but with the poles turned to the rear, for the conveyance of the wounded to the latter. If the battle be successful both places of help are moved gradually forwards; if, on the contrary, it is unfortunate, it may be necessary to abandon wounded, surgeons, and attendants to the victors; the protecting ambulance flag being in such cases left flying.

*The Place de Pansement (Verhand-Platz)* is the centre for aid for all the wounded of the division; and, unless in exceptional cases only, one is established, and is as near the centre of the line as practicable, and at a distance in rear of three to five thousand paces, so as to be out of fire. It is established in such buildings as may be available, or at a farm, care being taken that abundance of water, beds, mattresses, straw and hay, are readily to be obtained, so that the more severely wounded may be suitably provided for until such time as they can be transferred to the ambulances. The position of the place de pansement is indicated beforehand by the chief of the staff. In the absence of such an arrangement, the medical officer, and the officer in command of the sanitary detachment, select a position and indicate it by a distinctive flag by day, a coloured lantern by night. The direction at the spot rests with the principal medical officer of the division, whose time and attention are not to be occupied by the performance of manual professional duty. The medical officers are apportioned by him as required, every separate group being under the direction of him who is the senior. A medical officer selected by the divisional p. m. o., to whom he acts as a kind of aide-de-camp, is charged with the direction and appointment of orderlies to the medical officers, the superintendence of convoys of wounded, the placement of wounded in the carriages for them, and as to the disposal of field panniers, instruments, appliances, &c.

The officer in command of the compagnie de santé directs all



matters of a non-medical nature; aided by sous officers he preserves general good order and conducts the removal of the wounded, their transport to the ambulance, and thence to the war hospitals. The officer of the train des équipages is always subordinate to him who commands the infirmières, even when the former is senior in rank. His duty is to see to the services connected with the transport, supplies, forage, &c., between the place de secours and the place de pansement; in other words, between the first and second lines of assistance.

The medical personnel of the place de pansement consists of the divisional chief surgeon and the medical officers of regiments, all of whom repair thither, with the exception of three or four who are left at the place de secours in rear of the division; thus the services at both are performed altogether by the surgeons of regiments engaged. The inferior personnel comprises the bearers of a field companion attending each regimental medical officer, and thirty soldiers of the compagnie de santé.

At the place de pansement it is only intended that such urgent operations shall be performed as do not admit of further delay; thus the performance of resections is absolutely interdicted. Restoratives and comforts should, however, be given as may be required, and such as are so severely injured as not to be capable of removal attended to as far as may be practicable. All those who are capable of removal should, as soon as they are properly examined and attended to, be transported to the ambulances and hospitals in rear, the convoys being accompanied by soldats de santé in the proportion of one to fifty patients (a number that seems far too small considering the amount of attendance that is necessary).

If the army advances the place de pansement takes that of the place de secours. If it retreats the wounded and material are removed with the greatest rapidity practicable; or if the wounded, surgeons, and attendants, must be abandoned to the enemy, the Convention of Geneva makes full provision for the contingency. After a battle patrols of soldats de santé and brancardiers, accompanied by medical officers, traverse the field; they remove the wounded of both armies, and having done so, bury the dead. When the offices at the place de pansement have been completed, such of the medical officers as do not happen to be needed with the ambulance rejoin their several regiments. The materiel de santé de reserve remains during battle in the vicinity of the place de pansement, in view to supplying such articles as may be necessary for the treatment of the wounded.

The *ambulance divisionnaire* (*Division Sanitats Ambulance*) is intermediate between the place de pansement and the war hospitals. According to the organization of 1864 there existed only one ambulance per corps d'armée, it being capable of receiving 150



wounded and giving temporary aid to 600 en route to the establishments further in rear. This ambulance constitutes an independent establishment under the charge of the chief medical officer of the corps d'armée, and does not furnish the ambulances for brigade use. It is also independent of the compagnie de santé. The divisional ambulance, on the contrary, is only a portion of the sanitary service of the division, unified and under the command of the divisional surgeon, and capable of receiving 50 cases of severe wounds, and temporarily relieving 200 in addition. Its special functions are to transport the wounded to the second line and to the stations d'évacuation, partly by means of hired or requisitioned conveyances, partly in its own carriages, and to take charge of such patients as may not be in a fit state to be removed. So long as the ambulance is united to the other part of the sanitary service of the division the command remains with the officer in command of the compagnie de santé; when it is separated the command passes to the officer commanding the detachment, who is himself responsible to the chief surgeon of the division. The articles of food required by the wounded are obtained from the magasins des vivres. In friendly countries they are purchased; in hostile districts they are obtained by requisition.

During the march the ambulance remains with the conveyances for the wounded and the carriages belonging to the place de pansement. In bivouac and in cantonments it is united to the sanitary services of divisions. If, when the division becomes engaged, there should happen to be a railway station at a short distance in its rear the ambulance should there establish itself. The ambulance should be 3000 paces in the rear of the place de pansement; it being itself intended to serve as a second place of that nature, where, sheltered from missiles, urgent operations may be performed. It should not, however, become a hospital, but the wounded should as soon as attended to be evacuated to those in the rear, where alone all such operations as are not of immediate urgency should be performed. Like all other establishments of the first line, it should be mobile, and capable of taking up, from time to time, such positions as may be demanded by the vicissitudes of battle. If the army advances it moves on to what was the place de pansement; if it retires it evacuates the wounded and so much of its material as may be possible. If there are in it wounded who cannot be removed on account of the severity of their wounds, they must be left with a sufficient establishment to take charge of them, including surgeons, attendants, stores, food, &c., an arrangement only practicable among civilised nations.

*The reserve of matériel* undergoes the same changes as the ambulance, but inasmuch as it pertains to a particular division and not to the corps d'armée, its changes are less frequent. It only



consists of two conveyances with a soldier in charge ; it is his duty to issue stores as required by the surgeon of the division, under whose orders he is.

*The second line or war hospitals.*—These receive temporarily the sick and wounded, whom they evacuate as fast as possible to the fixed hospitals in the rear. They have their own independent organization, including personnel, matériel, and means of transport. Their personnel, however, is not drawn from the army, but from hospitals in the interior, on the requisition of the minister for war. Their number and importance vary according to the requirements of war ; there are usually two or three of them per corps d'armée, but they do not follow its movements, remaining, as a rule, at a distance of three or four leagues in rear, and so placed as to maintain communication between the army and the frontier. While the army is on Austrian soil its special hospitals should be used as little as possible, the sick and wounded belonging to it being dispatched to the permanent hospitals of the country, with the exception of those who are too ill for transfer, or so slightly indisposed as to be likely to rejoin the ranks after short treatment. When the army advances the untransportable are either left in a civil hospital, or, in the absence of one, a sufficient establishment for their proper care is detached. When a battle is imminent they are directed to their several positions, either by orders from the general in command or by the principal medical officer. If the army should be forced to retreat, the hospitals not in active use should retire behind the nearest lines of defence and there prepare to receive the wounded ; the other hospitals should carry with them so many of the wounded as can be transported, leaving such as are not together with the staff necessary for them.

The direction of the hospitals, like that of the others rested with the intendance, represented by a commission composed of a general or colonel, a commissary and a surgeon-major, the latter aided by a regimental surgeon who took his place when he was on other duty. The organization of 1870, however, suppressed this commission and delegated their direction to the principal medical officer in communication with, and subordinate to, the intendance, but with the responsibility over hospitals of the second line as well as the others. He was moreover charged with the distribution among them of resources placed at his disposal by societies of aid and to concert with the representatives of such societies. He is to communicate with the director of railways and with the intendant in regard to conveyance and other arrangements for wounded about to be evacuated. In fact, however, although the responsibility is upon the medical officer, the control and direction remains with the intendance. The following is the personnel of a hospital of the second line, namely :—



*Administrative.*

- 1 Captain.
- 3 Subaltern officers.
- 1 Comptable.
- 2 Adjutants.
- 1 Sergeant-Major.
- 4 Sergeants.
- 7 Corporals.
- 40 Infirmiers of the first class.
- 60 Infirmiers of the second class.
- 1 Armourer.

*Religious.*

- 1 Almoner.

*Medical.*

- 1 Regimental surgeon in charge.
- 3 Regimental medical officer in charge of wards.
- 3 Medical superior officers.
- 9 Aides hospitallers.

*Servants.*

- 13. Orderlies or medical officers.

An arrangement has been made whereby a hospital of the second line may consist of 600 beds, and be capable of sub-division into three of 200 each, with a superior medical officer at its head. The materiel for 500 beds is divided among fifteen waggons; that of 600 beds, divisible as stated, is carried in twenty-one waggons, or seven for each. Of these seven waggons, the first contains the instruments and surgical apparatus, dressings, &c.; the second the cooking utensils; the third the hospital utensils; the four others the bedding.

*Les stations des malades.*—Arrangements are made at points along lines of railways, and of navigable rivers, for the reception, temporarily, of sick whose state is such as to render rest necessary. In time of war similar arrangements are made in the country in which the army may be operating, the necessary arrangements being, in both cases, made by the intendance under the orders of the general in command.

*The establishments of the third line* comprise (a) the depôt of sanitary materiel; (b) the temporary hospitals; (c) the hospitals established by societies of aid; (d) the fixed hospitals in garrison, and the regimental hospitals. All military hospitals within range of the theatre of war are utilised for the service of the army.



## SPAIN.

By Royal Decree dated 1862 the hierarchy of the corps de santé comprises the following ranks, namely—

|   |   |   |     |              |                 |
|---|---|---|-----|--------------|-----------------|
| Director-General                              | . | . | .   | ranking with | Major-General.  |
| Inspector                                     | . | . | .   | " "          | Brigadier.      |
| Sous-Inspectors, 1st class                    | . | . | " " |              | Colonel.        |
| " " 2nd class                                 | . | . | " " |              | Lieut.-Colonel. |
| Medicins Majors                               | . | . | " " |              | Commandant.     |
| Assistant-Surgeons, 1st class                 | . | . | " " |              | Captain.        |
| " " 2nd class                                 | . | . | " " |              | Lieutenant.     |
| The candidates for appointments have no rank. |   |   |     |              |                 |

The cadre of medical officers is increased or decreased according to the requirements of the army. To meet the necessities of sudden increase, auxiliaries and volunteers give their services, agreeably to prearrangement, to stationary dépôts, garrisons, and to conscripts on their way to join their regiments. The director-general enjoys the same rights and privileges as do the directors general of military establishments. He directs in all that concerns the professional details of the army, after taking the views of the superior medical council. He is specially charged with the initiation of measures for the preservation of health of the troops, he submitting his propositions on this subject to government. The inspectors form the superior council, the director-general being president; they perform inspections at such times as they are ordered by him to do so. The sous inspectors are the chefs superieurs of the medical services in their several districts. They communicate directly with the captain-general in regard to all that concerns their service. They direct their own department in their district, and are responsible for its efficient working. They may provisionally suspend their subordinates in cases of dereliction of duty, reporting having done so to their captain-general and director-general. They inspect the hospitals in their several districts, and preside at invaliding boards.

Surgeon-majors are attached to hospitals, the senior for the time being in charge, and all the other medical officers connected with the establishment are under his orders. He has charge of all hygienic arrangements, as clothing, food, and treatment of the sick. He demands from the chef administratif whatever he deems to be required for the good of the sick, and in the event of the latter declining to comply, he reports the circumstance to the principal medical officer of the district. Assistant-surgeons perform the service with regiments; those of the first class in the special army and military schools; those of the second class in the infantry and cavalry. The apothecaries' service is distinct by itself.



Admission to the medical department takes place by public competition, candidates being doctors of or licensed to practise medicine, and under thirty years of age. Promotion beyond the grade of second class assistant-surgeon to that of sous inspector of the second class is given, two parts by seniority, and one by selection; beyond that rank altogether by selection. Literary or scientific merit, and special services performed, constitute claims for promotion by selection; but in order that an officer may be thus advanced, his name must be in the upper third or half of those in his grade, according to the rank from and to which he is about to be promoted, except in time of war; then eminent services are rewarded by advancement, irrespective of position on the list, provided that a medical officer has served three years in his grade. Eminent services in hospital, or the fact of their having been attacked by typhus fever in the performance of their duties are considered equivalent to distinguished service in the field with regard to promotion and retirement. The uniform of medical officers is different from that of the other corps of the army; it is handsome, and at the same time distinctive in regard to the several ranks.

The organization of the medical service, so remarkable in itself, has further been rendered complete by the institution of *compagnies sanitaires* for service as attendants, &c., in hospitals, and to serve as a cadre of *compagnies de secours*, necessary in times of war, and to follow the army. Each such company includes a captain and lieutenant, charged with their military instruction and discipline; an assistant-surgeon charged with their professional instruction, and of men of first and second class, the former being non-commissioned officers, the latter orderlies. The chef of each company is the sous inspector of the district, and respectively the senior medical officer of the station. The sanitary companies consist of men who continue their service entirely in them. They are held to be applicable, not only to Spain itself, but also to the forces serving in the Philippines and in Cuba.

#### PORTUGAL.

The staff of the sanitary service consists of a surgeon-in-chief of the army, with the rank of colonel, two surgeons of divisions with that of lieutenant-colonels, and six brigadier-surgeons as majors. The surgeons-major rank with captains, the surgeons with lieutenants; these two grades are only with regiments and establishments, their numbers depending upon the needs of the service. The sanitary company (army hospital corps) consists of a captain, lieutenant, sub-lieutenant, and sixty privates, with their proportion of seven commissioned officers. The direction of the medical corps and sanitary service consists of two departments, one attached to the



war office, one to the commander-in-chief: the surgeon-in-chief directs the former, he being assisted by two staff-surgeons.

In time of war the division surgeons will be the sanitary officers of their several divisions, the brigade surgeons fulfilling similar duties; in times of peace both of them reside near head-quarters or at the seat of the united regimental hospitals. Surgeons who, owing to their state of health or age, are unable to serve in regiments are appointed to fortresses, the military arsenal, invalid hospital, and military college. The men of the health company are under the orders of the surgeon-in-chief; those in hospitals receive their orders from the directors of those establishments, the captain and subalterns who are selected from the inferior officers of the army having charge of discipline. The soldiers of this company are selected from among men employed in regimental hospitals, men wounded or otherwise disabled from active military service, but fit for duty in hospital, and civilians who wish to serve. They engage for eight years, at the end of which period they may re-engage for four more. They have the same privileges as and rank with the company of engineers, but will be liable for repeated offences to be sent to the ranks of the army.

The sanitary consulting committee of the army meets at Lisbon. It consists of the surgeon of the first military division, the director of the military hospital there, and the senior staff-surgeon of the troops in garrison. It attends only to work ordered by the minister of war, or to such as the surgeon-in-chief submits to it.

Promotion for all military surgeons will be usually by seniority, although scientific merit or extraordinary services will give individuals an additional claim. The surgeon-in-chief will recommend to government those who have rendered themselves worthy of honorary distinctions.

Hospitals in times of peace are permanent and regimental; in times of war, permanent and temporary. The direction of the two permanent hospitals at Lisbon and Oporto is entrusted to brigade surgeons. In each permanent military hospital the board of direction will consist of the director and two staff-surgeons. It will be entrusted with the funds, which will be received into a chest with three keys, one for each member of the board. The regimental hospitals of Elvas and Chanes, and other united regimental hospitals, will have a staff of employes from the health company, composed of clerks, buyers (stewards), keepers, nurses, cooks, and servants. In times of war temporary hospitals will be established at convenient stations, for the prompt and easy reception of sick or wounded from corps in operation. Their organization will be the same as that of the permanent hospitals. When a detachment is stationed at a place where no military hospital exists and where a regimental hospital cannot be opened, the surgeons in communica-



tion with the officer commanding will establish an infirmary, using the ambulance linen and clothing, and sending the severe cases of illness to the nearest civil hospital.

The ambulance of each infantry corps, both in peace and in war, consists of two ambulance carts according to pattern, 6 large stretchers, which can be taken to pieces, 2 small hand stretchers, and 30 beds complete.

#### ITALY.

The medical service of the army of Italy has undergone the process of reorganization several times since 1850. In that year the separate classes of physicians and surgeons were fused in one; in 1856 modifications were made in the designation and relative ranks of the several grades and in regard to the admission of candidates; in 1861 a principal medical officer was appointed to each military district or for each corps d'armée, and in 1867 further changes took place. In accordance with the orders published in that year the following was the hierarchy of the department, namely—

|  |                          |
|--|--------------------------|
| 1 President of Council . . . .                       | rank with Major-General. |
| 4 Inspectors . . . .                                 | „ „ Colonel.             |
| 6 <i>Medicins en chef</i> . . . .                    | „ „ Lieut.-Colonel.      |
| 28 Division Surgeons . . . .                         | „ „ Major.               |
| 200 Regimental Surgeons 1st and 2nd<br>class . . . . | „ „ Captain.             |
| 350 Battalion Surgeons, 1st and 2nd<br>class . . . . | „ „ Lieutenant.          |

The pay of each of these grades, except the President and Inspectors, undergoes an increase after each period of five years in the several ranks. Promotion from one class to another in the same rank takes place by seniority; that of battalion surgeon to regimental surgeon; that of regimental surgeon to *medecin directeur* after examination; that from *medecin directeur* to *medecin-en-chef* of a department by selection purely. In the examinations for promotion that take place the three seniors in the rank below compete, and if after two such examinations an officer is found ineligible, he forfeits all further advancement.

The "sanitary corps" consists of (a) medical officers, and (b) *compagnies de santé*. The *comité de santé* is entirely consultative in its nature, in reference to questions bearing upon the health of the army, and its duties are to study all such matters and bring them to the notice of the minister for war. It consists of a president, the major-general *medecin*, and four colonels *medicins*, an apothecary, and a secretary.

The *compagnies de santé* are instituted with a view to provide for



the services of the military hospitals and ambulances in time of war. Their number is equal to that of the divisional hospitals, their numerical strength in proportion to the needs of those hospitals; they are commanded by the officers pertaining to those hospitals under the orders of their several principal medical officers.

The corps of comptables are charged with the duties of supply, subsistence, and accounts, not only in regiments but in hospitals. The ranks of this corps are supplied exclusively from those of officers and sous officers of the army.

In times of peace the medecins en chefs are attached to the principal military hospitals of their departments, in times of war to their corps d'armée, in connection with which they assume the superior direction of medical affairs. The medecins directeurs are the medical chiefs in the divisional hospitals beyond the departments, and take charge of divisions of corps d'armée. The surgeons of regiments and of battalions are employed without distinction in hospitals, ambulances, or regiments.

Apothecaries form a separate body. Up to a recent date the organization of this department was altogether according to the French model. The medical officers were in all things subordinate to the intendance. On service hospitals were directed by captains of the corps d'administration, in towns by an officer of even lower rank. The senior medical officers had no direct authority, professional or otherwise, upon their juniors, nor could they correspond with them except through the intendance, nor could they by right offer any comment to the intendance even should they find the patients insufficiently attended to. Before an expected battle they requested the intendance to order such surgeons as might be necessary to particular ambulances, and in concert with it made arrangements for the removal of the wounded and for attendance upon them. The organization comprises ambulances, temporary hospitals, and fixed hospitals.

*Ambulances.*—These are only divisional ambulances. Each comprises 7 medical officers, viz. 1 surgeon of division, 2 regimental surgeons, 4 battalion surgeons, 1 apothecary, 1 sous officer, 1 quarter-master, 1 serjeant, 1 corporal, 1 soldier to take charge of the patients who have been bled, 1 assistant apothecary, and 20 infirmiers; total 34 persons. The divisional ambulance for cavalry only include 13 persons, of whom 3 are surgeons.

*Temporary* hospitals are of three orders. The first contains 100 to 200 patients, the second 200 to 300, and the third 300 to 500. The personnel for a hospital of 100 patients is 1 surgeon-major, 5 assistant surgeons, 1 apothecary, 1 surgery man, 1 officer as director, 1 sous officer, 1 serjeant, 2 corporals, 2 soldiers for patients who have been bled, 17 infirmiers, in all 32 persons, to whom is



to be added an aumonier. These hospitals had a council of administration composed of the director as president, the officer of administration, and the senior medical officer as members.

On service there is at general head quarters a reserve of 10 surgeons and 16 infirmiers. The divisional ambulances are capable of being divided into sections for active work, and as reserve. The active section admits of being again divided into the light ambulance and its dépôt, each section having two medical officers. It is not necessary to enter into more details in regard to the former condition of this service, as the events of 1870-71 on the continent have led to the introduction of important alterations in its entire constitution and mode of working.

By a decree dated 17th November, 1872, the powers and responsibilities of medical officers have been materially extended, and at the same time placed more upon a footing in accordance with the important duties required of them than they had previously been. In issuing the decree in question, the king, Victor Emanuel, followed the example shown by Germany, the government of Berlin having only shortly before instituted improvements the urgent necessity for which had become apparent in the great campaign of 1870-71.

According to the orders in question, the duties of director of each divisional military hospital will be performed by the principal surgeon of the hospital previously charged merely with the departmental details. To enable him to superintend the administration, he is invested with the authority of an officer in command of a regiment, in all that pertains to personnel and materiel of the establishment. The council of administration of the hospital will include the principal surgeon as president, the two medical officers next in seniority, and the purveyor (comptable) as members, the latter acting moreover as secretary. Regimental surgeons performing duty in the hospital become members of this committee according to their dates of seniority; and it is further added—all previous regulations contrary to the present decree are abrogated. The principal medical officer in each division is moreover charged with the supreme direction of all within such division, even to the financial concerns. In each hospital its separate accounts are kept, as also a pay chest, the latter provided with three keys, one to be retained by the senior medical officer, a second by a member of the committee, and the third by the secretary, who must also be treasurer. In other respects no change takes place in regard to the routine of performing duty and furnishing reports and returns.

Italy, struck, it is said, by the picture of the results of imperfect organization portrayed by the writer of the "Battle of Dorking," resolved to lose no time to improve that of her army in all its branches; accordingly, observing the successful working of the medi-



cal service in that of Prussia, has hastened to adopt that model with its very latest improvements.

In accordance with the provisions of the latest orders on the subject, the officers of the *corps de santé militaire* have actual rank, together with its rights and obligations, as in the case of "combatant" officers. Their duties, however, are generally departmental under all circumstances. In the hierarchy of the army the several grades of medical officers are enumerated thus: viz. major-general-medicin, colonel-medicin, lieutenant-colonel-medicin, major-medicin, capitaine-medicin, lieutenant-medicin, and sous lieutenant-medicin.

#### SWITZERLAND.

The army of the Swiss Confederation, like the militia of England, is in ordinary times not actually embodied, although ready at all times to be so, together with all appliances and auxiliary services connected with it. Each canton furnishes its quota of troops, equipment, stores, transport, and ambulance establishment; officers of cantonal troops are also furnished by the canton, those of the staff being selected from among the whole, and employed under the commander-in-chief of the army. During peace the sick of the militia are treated in the civil hospital of their canton, and it is the happy privilege of the government to need no further military arrangements than such as are required for defence. For the latter purpose the medical arrangements of the army exist upon a very efficient footing.

When war breaks out, when battles cease, and the field is strewn with wounded, then it becomes indispensable to have in the vicinity establishments to which to transport the wounded, where they may receive every care, have necessary operations performed, and be treated until such time as it becomes possible to send them to the hospitals. Such is the object of ambulances or removable hospitals.

The personnel of the *service de santé* of the army is composed as follows, viz.:

1. The surgeon-in-chief with the rank of federal-colonel, that is, major-general, is charged with the superior direction and surveillance of the *service de santé*, its personnel and materiel.
2. The surgeons of divisions, with the rank of lieutenant-colonel or major, are charged with the superintendence of the service in their several divisions.
3. For the service of ambulances and hospitals, the surgeons of ambulances with the rank of captain-lieutenant and sub-lieutenant, the commissaries of ambulance, and the infirmiers.
4. For regimental service, the regimental medical officers, namely, one battalion surgeon with the rank of captain, one assistant-surgeon



with the rank of sub-lieutenant per battalion of carabineers, one surgeon with the rank of captain or lieutenant per company of sappers, pontonniers, artillery, or squadron of cavalry, one surgeon with the rank of lieutenant, a sufficient number of brancardiers being in times of war provided by the company itself.

### 1. *Regimental Service.*

The essential character of the regimental medical service is that of complete mobility, equal to the mobility of the troops themselves. To treat the sick and wounded on service in these establishments is absolutely impossible; they must, under such circumstances, be left behind. The medical service of regiments is none the less of extreme importance. To maintain the men in good health by the energetic prescription of sanitary measures, to avert epidemics and mitigate their severity when they occur, to direct the sick and wounded to the nearest sanitary establishments, such are the duties of the regimental departments on the march, during manœuvres and on active service. During battle it affords to the wounded their first assistance, consisting as this does in searching for them on the field, comforting and encouragement, applying temporary dressings and apparatus where bones are shattered, placing and removing them with suitable arrangements and precautions, and in accordance with scientific principles, from the spot where they fall to the place of help. Another portion of the same service undertakes the intermediate care of the wounded, replaces tents, rectifies mechanical appliances, and performs such operations as cannot with propriety be adjourned. The place of such help must also be essentially mobile, the surgeons and infirmiers following the force in all its movements; and to enable it to be so, it has been recommended by the Conference of 1871 to attach to each company 1 infirmier and 2 brancardiers, to each battalion 2 medical officers, 1 sous officer of infirmiers, and 1 sous officer in command of brancardiers.

### 2. *Ambulance.*

The ambulance, less tied to the movement of the troops than are the regimental establishments, has for its object to give the wounded the advantage of quiet and further care that cannot be given by the regimental establishments. Each brigade will for this purpose have attached to it a section of the ambulance, composed of 3 surgeons, 1 commissaire de santé, 10 infirmiers, 30 brancardiers, and a proportion of the train according to requirements. It is necessary, for the proper placement and working of the ambulance, to have a knowledge of the topography of the field of operations. For this purpose the divisional surgeon should place himself in communication with the general in command, and with him arrange whether the ambulance shall be retained entire or act by sections.



The place selected for its establishment must, if possible, be out of range of the enemy's fire, and so situated that patients may readily be despatched from it towards the rear; and, as a rule, it has been determined that when the scene of hostilities consists of plains, the ambulance should act in its entirety, but in uneven or hilly country by sections, each with its brigade.

The principal purposes of an ambulance are the following, namely, the reception of sick and wounded, and these should above everything receive all needful care and refreshment; the application of such apparatus as may be necessary to enable them to be further transported, and the performance of needful operations; their transport from the place of first help to the ambulance, and from it to the field hospitals, where the real treatment of cases must be carried out. The section d'ambulance constitutes the place of surgical help for a brigade; the evacuation or transfer of the wounded must ever be one of the chief subjects in the mind of the principal surgeon, for in this way alone is it possible that the ambulance can follow a force.

### 3. *Field Hospitals.*

The evacuation of wounded received in ambulances should be directed upon stationary hospitals, in near proximity to the theatre of war, regular hospitals, maisons de santé, barracks, &c., being arranged and fitted up with all requirements for the purpose brought from the federal magazines. But neither are such establishments always in existence, nor are they often sufficient; hence the conference of revision recommends that to each division should be annexed a war hospital sufficient to receive the sick and wounded evacuated from the ambulance, and serve the purposes of a reserve. The war hospital should, like the ambulance, be capable of being divided into sections according to brigades; the fact that it pertains to a particular division, however, should never be lost sight of, and during active service transfer its ordinary patients to establishments farther in the rear, so as to be the better prepared to receive wounded from the front, and these in their turn, so as to be prepared to follow up the troops in case of an advance. The conference attaches great value to these establishments for the treatment of sick and wounded, and consider that each should comprise the following as personnel, namely, 9 surgeons, 1 apothecary, 3 commissaires de santé, 24 infirmiers, 12 brancardiers, and train as reserved. In time of peace the personnel works as a military hospital, where each surgeon and soldier are expected to increase their knowledge in view to assuming their respective parts when the emergency of war occurs; and then, thanks to such organization, the field hospital will be ready to put itself in movement and join its proper division at the first signal to do so. When the battle has begun, and the sections of ambulance have taken their positions at the places of assistance, the



field hospitals should be in sufficiently near proximity to be able, on the orders of the principal surgeon of the division being issued, to follow the division should it continue its advance, for the purpose of collecting and properly attending to such wounded as may in the hurry be overlooked or left at the places of first assistance by the ambulances which have to follow the movements of their respective brigades. If, at the time, the field hospitals should happen to be full of sick, these must be evacuated to other establishments with the least practicable delay, so that they may themselves follow the divisions to which they appertain. If this cannot be done entirely, at least one of their sections must follow.

#### 4. *Evacuations and Reserve Hospitals.*

One of the most important functions of a good service de santé is the well-regulated organization of a service for evacuating the wounded as quickly as possible. The train sanitaire is an institution at least as indispensable as the detachment sanitaire. Not only is it necessary that the wounded should, as speedily as possible, receive the first aid, but it is equally essential that they should have the benefit of quickly being admitted into hospitals where more care and attention can be bestowed upon them than is practicable near the scene of hostilities, and where the evils of overcrowding must be carefully guarded against.

Instructed by the experience of the last great war, where the Germans obtained so great advantage from the plan they adopted of scattering the sick and wounded, it has been purposed in reference to Switzerland that the railway companies should be directed to construct their carriages of the third class with reference to the eventuality of their being required for the transport of sick or wounded, and that they be informed that in case of need the existing carriages might be required for the same purpose.

All the persons employed in the execution of the service de santé, including medical officers, commissaires, apothecaries, infirmiers, and brancardiers, constitute a special corps the command and direction of which are vested in the chief of that service. He distributes the personnel among regiments and sanitary establishments; he directs and superintends the instruction, professional and military, of the surgeons, controls the instruction of the troupe sanitaire, and proposes to the federal council the names of candidates for promotion. Subordinate to him is a staff composed of a chief of the staff, a chief of the hospital service, a chief of that of evacuations, of a delegate from voluntary aid societies, an apothecary, and lastly, adjutants and secretaries as may be required. Under his orders the divisional medical officers do duty. Each of them is entitled to the services of an adjutant and a secretary; also the surgeons in charge of brigades or directors of sanitary establishments.



The *troupe sanitaire* has its own mode of recruitment. The *infirmiers* are selected from among the more intelligent of the *brancardiers*. They are each provided with a water-bottle and six bandages. Medical men in possession of diplomas enter the army with the position of officers. They carry swords, and on service wear a tunic similar to the blouse worn in the Austro-Hungarian army. Each is provided, in addition to his pocket case, with a saddle bag containing articles for immediate use. They are all mounted while on service. There are no sanitary conveyances attached to the corps. To each medical officer there is attached an orderly (*porte sac*) charged with the carriage of needful apparatus and medicines. Each battalion will be provided with eight *brancards*.

On the subject of voluntary help the conference observes that the societies of aid are necessary in order to assist the official service de santé in that portion of its duty which consists in observing and preserving the troops in good sanitary condition, and still more, to help them in the exercise of their service properly so called. The latter object is obtained (*a*) by obtaining for the ambulances the use of hospitals and asylums, and necessary material; (*b*) in forming corps of evacuation, including transport and stations; (*c*) in making hospitals of their own, and in supplying administration and medical service in the military hospitals; (*d*) in facilitating the discharge of convalescents and invalids. It is added, however, that this association of duties need only be accepted on condition that the understanding is complete between the volunteer and the military medical element, and that the former shall be subordinate to the latter. Early in 1872 the chief of the service de santé submitted the following points to the military medical officers: each of whom was requested to give his opinion in regard to it, namely,

1. What modifications should be introduced among our ambulances, so that they may fulfil the duties of the detachment sanitaire during battle, and also those of field hospitals? or should the two functions be fulfilled by distinct and separate corps?

2. Is the present instruction of the sanitary personnel sufficient? Is it necessary that the surgeons should undergo a course of special sanitary training prior to their being appointed to the army?

3. Should the present case of instruments of surgeons be modified? If so, how?

4. Taking into account that the haversacks of the ambulance may be replenished whenever, during battle, the reserve stores are on the ground, are the apothecaries of corps really superfluous while the troops are cantoned, whether in time of war or during peace? Are the twenty medicaments proposed sufficient as regards the corps? What new medicaments are considered necessary?

5. Are the proposed forms of reports satisfactory?



## BELGIUM.

The service de santé in the army of Belgium comprises medical officers, apothecaries, and veterinary surgeons. The personnel of the two former consists of 1 inspector general, 4 principal surgeons, 7 garrison surgeons, 28 regimental surgeons, 29 battalion of the first class, and 38 of the second class, 20 assistant surgeons; 1 principal apothecary, 8 apothecaries of the first class, 12 of the second, and 10 of the third. On a war footing there is a regimental surgeon for the staff of each regiment of infantry or artillery, and a battalion surgeon or assistant surgeon for the staff of each regiment of engineers. The various grades of the service de santé are assimilated with military ranks, the inspector-general as major-general, *medicin en chef* as colonel, principal surgeons as lieutenant colonels, surgeons of regiments as captains; but after ten years' service as majors, battalion surgeons, second captains, or lieutenants, according to service, the assistant surgeons as sub-lieutenants.

To enter as assistant surgeon the candidate must be 28 years of age, have spent six years in the study of the profession, and have passed as doctor of medicine. To obtain promotion to the rank of battalion surgeon, two years in the first grade and an examination as to fitness must be passed. Exchanges are allowed to take place between the medical officers of the army and those in the navy, although these services are distinct up to the rank of *medicin de regiment* inclusive; beyond that grade medical officers of both services compete for further promotion.

The service de santé is administered by an inspector-general, who is immediately responsible to the minister for war, all medical offices being, as regards departmental details, placed under him. Annual inspections take place by the *medicins en chef* and *principaux*, their inspections, however, being limited to sanitary establishments, and these, when accompanied by the *intendant* and officer commanding on the spot. Minute instructions are published on the subject of those inspections, which are of a very searching and formal nature. He also makes an equally careful inspection of the barracks occupied by troops, with regard to the sanitary arrangements connected with them. The medical officers are subject to military as well as to hierarchical discipline among themselves, and juniors are directed on all occasions, whether on or off duty, to salute their departmental superiors. The right of placing medical officers in arrest is accorded to their departmental seniors, and medical officers sit as members of courts martial for the trial of medical officers. They report to their own superiors on matters tending to affect the sanitation of the troops. Those who are absent from their stations, whether on leave or otherwise, have to report themselves to the military and medical authorities, in



whatever garrison they may be visiting. If on leave of absence beyond fifteen days per annum, they are reduced for such time to a rate of half-pay. Accidents and disabilities met with while in the discharge of duty are held to entitle to pension as wounds received in action.

The surgeon of a regiment conducts the medical affairs of the corps, and corresponds with his chief on professional details. He keeps an etiological register, as well as one for cases of granular eyelids among the men, the necessity for the latter seeming to indicate that sanitation in barracks admits of improvement. The surgeon is responsible to the colonel of his regiment; to them he offers such suggestions as may be received to preserve health, the officer commanding being the judge as to whether they are to be adopted or not. Once a week, in presence of the military officers on duty, they inspect the men in barracks. They are to be vaccinators of all in the regiment, but before subjecting a whole corps to the process of re-vaccination the sanction of the inspector-general has to be obtained. A medical officer of one corps may, on the recommendation of the senior medical officer, be ordered by the officer commanding in garrison to do duty with another corps. Besides the regular medical reports, medical officers transmit to the inspector-general accounts of any outbreak of sickness or other extraordinary occurrence that may take place. On the occasion of troops bathing a medical officer is in attendance, provided with the apparatus for the recovery of the apparently drowned; one medical officer per regiment accompanies the troops at drills; in ordinary times, however, medical officers only accompany the troops to whom they are attached. When troops are on a march the medical officer gives sanction to such men as are incapable of fatigue to precede the corps, or be admitted into hospital. He also recommends the men who become weak on the line of march to have their arms and accoutrements carried upon the light carts accompanying them. A medical officer always remains with the light carts to give needful help to soldiers who require to be carried.

The ambulances in the army of Belgium are represented—1, by the ambulance waggons which follow the head quarters of divisions and brigades; 2, those of medicaments of corps which remain with the head quarters of regiments; and 3, the knapsacks or saddle bags of ambulances confided to the medical officers of corps. The ambulance waggon contains various articles of medical and surgical stores, arranged in their separate boxes according to lists published in official regulations, the whole being equal to 1454 dressings. The regimental medicine chests for the field are prepared according to a standard list by medical officers when their corps receive orders to march, the necessary supplies being obtained from garrison stores and from the administration. In the infantry, cavalry, and artillery,



a certain number of knapsacks (sacs) and saddle bags are allowed for containing medicines and instruments actually needed on the field. The proportion of these varies according to branches of the same. Thus, for the regiment of carabineers there are 5; for the fifteen other regiments of infantry, each have four; for the two regiments of cuirassiers, each have two pairs of saddle bags; for the other five regiments of cavalry, each 3; for the four regiments of artillery, each 2 pairs. The sacs and saddle bags are under the charge of the medical officer. They are carried on the march by the orderlies of the surgeons if in the infantry, and on the orderlies' horses if in the cavalry.

In garrisons the direction of the hospitals rests with the principal surgeon; the infirmiers are under the regimental medical officers. The regimental medical officers take their turn in attending sick in the garrison hospitals, whether of their own regiment or of others, and under the authority of the principal surgeon. Once a month the medical officers hold a conference, at which they are, by regulations, expected to be present. In matters of administration of the hospital, medical officers are not permitted to have any voice, any suggestions they have to make having to be addressed by them to the commandant or intendant. Assistant surgeons, pharmaciens of the third class, and students, have to take their turn of duty in the hospitals as orderly officers. The regulations of the service contain a very important paragraph bearing upon inducement for medical officers to work. Two medals, of the value of 100 francs, will be conferred yearly upon the medical officer, veterinary surgeon, or apothecary, who will submit the best essay upon subjects connected with their respective branches. In connection with each hospital a library of scientific works is maintained, a sum varying from 200 to 400 francs being appropriated each year, by government, to keep them supplied with works.

#### UNITED STATES.

The principles according to which the duties of the medical department of the American army are conducted comprise unity of action and responsibility confided to its officers. The department is complete in itself. It performs its functions under the orders of the surgeon-general, who is himself subordinate to the minister for war, but independent in regard to his special functions of other authority.

Every sick or wounded soldier, from the time he is brought to hospital, is in every respect under the charge of the medical service, including not only his professional treatment, but his transport, food and discipline. In order to carry out the duties



in all other respects, the medical officer in charge of a hospital has all the rights and authority of a commanding officer.

The formation of stationary and field hospitals, of ambulances, means of transport by rail or water, in fact, all administration of these services, is remitted to the medical department, the entire responsibility in regard to them resting with the director-general. All employés attached to the different hospitals, ambulances, or to transports of the sick, and all the functionaries employed in connection therewith, are under his authority and orders.

The medical officers enjoy, in all respects, the same rights and privileges as other or "combatant officers." They wear the same uniform, the same distinctive badges of rank, receive the same honours and advantages. All of them, whether attached to regiments or hospitals, perform their duties under the superintendence and authority of the head of their department, so that the medical officers are in no way incorporated in the regiments, and only receive their orders through their own departmental chiefs.

The personnel of the department capable of being increased in time of war is, under ordinary conditions, limited to the following, namely,

- |                     |  |                            |
|---------------------|--|----------------------------|
| 1 Surgeon-General   | . . .  | ranking as Major-General.  |
| 1 Surgeon-General   | . . .  | „ Brigadier-General.       |
| 1 Inspector         | . . .  | „                          |
| 16 Inspectors       | . with the rank of Colonel and Lieut.-Colonel. |                            |
| 170 Sergeant-Majors | „  | Major, Captain, and Lieut. |
| 6 Storekeepers.     |  |                            |

The service of the pharmacy is attended to by subordinate agents (stewards), who also perform the minor operations.

On service the medical department is organized on the footing of an independent hospital and an ambulance train for each division of three brigades. Sometimes three or more divisional hospitals are united under the charge of a medical director, assisted by an inspector, quartermaster, a commissary, and an officer of the ambulance trains. The advantages of such an organization are incontestable. They were demonstrated during the war of Secession, and the only matter for wonder is the tardiness with which a similar system is being adopted in European armies.

Dr. Chenu writes thus regarding this branch of the American army :—

"The entire control and administration of hospitals was confided to the medical department, and with such good results that never before in war had the mortality among the wounded been so small, never had hospital wards been so little crowded. In hospitals and ambulances the medical officer made his demands direct upon the



quartermaster-general's department or the commissariat, according to the nature of the requirements."

When the war began the medical department was only equal to about 20,000 troops. It was organized upon the French plan. When, after the capture of Fort Sumpter, the army had to be increased, volunteers were called for, the officers were selected by the men, but being ignorant of military duty, and especially of the art of preserving the health of their men, heavy losses in battle and by sickness were the results. Immediately, however, the medical service was placed upon a better and more extended system, committees of aid were everywhere appointed, and these, subsequently organized as the United States Sanitary Commission, supplied the sick and wounded not only with medical officers and attendants, but with all necessary supplies, and even means of transport and accommodation, besides furnishing means for protecting the health of the effective, and publishing a series of instructions for the guidance of men, officers, and surgeons in regard to hygiene, surgery, and medicine. This sanitary commission placed itself in connection with, and subordinate to, the official department; its declared object being the prevention, if possible, of loss of life by disease, such as France and England had to deplore in the Crimea.

The director of the medical service had declared that the organization of his department was unequal to the new conditions.

So little experienced were the military officers at the beginning of the war in the necessity for, or requirements of, hygiene, that on questions being put to them on the subject of food-cooking, ventilation, cleanliness, &c., as these bore upon the men, they replied that "their business was to fight, not to keep a boarding-house." The attendants upon the men were rough, untrained men, from the ranks of the army; the medical men selected in haste from civil life, without knowledge of military medicine or surgery. The sanitary commission controlled these conditions, including the ignorance of both officers and surgeons. The medical department was emancipated from the commissariat, and made entirely independent under its own dictator-general; large military hospitals were established at different points; the entire direction of personnel and materiel placed under the medical officers.

No sooner had the medical department been emancipated than improvements were introduced into the mechanical as well as other means for the comfort and well-being of the wounded. Steamers were fitted up for their transport, a medical officer being in charge of all departmental details, and having an ample staff for his duties. Carriages for their suitable conveyance were proposed, and those on lines of railway fitted up; and the question is asked, why were similar arrangements not made in France during the Crimean and Italian wars?—Because of the subordinate and dependent position



held by the medical service there. Another improvement effected by the Americans was in the arrangement of tents and huts as hospitals, and the result of all these measures was that on no former occasion in war had the mortality, by wounds and sickness, been so small.

In these hospitals the soldiers were led to feel that they were relieved from the surveillance and strictness of barrack life. Everything was made subordinate to the care of the sick. Gardens were formed around hospitals for the cultivation of antiscorbutic vegetables and of flowers. Soldiers' houses were established for the reception of sick and wounded men on furlough, where they could have board, free access to reading and smoking rooms, clean clothes, and, in fact, everything necessary for their comfort; every possible care was bestowed upon the soldier alike in health and when sick or wounded, with a result that 100,000 lives are usually considered to have been saved in this way.



THE HISTORY OF THE  
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TO THE PRESENT TIME  
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THE  
ADMINISTRATIVE SERVICES  
DURING THE  
FRANCO-PRUSSIAN WAR.

BY CHARLES ALEXANDER GORDON, M.D., C.B.

PRUSSIA.

The literature of the Franco-Prussian War has already assumed gigantic proportions. The conditions which on the one hand led to great and unexpected successes, and on the other to no less great and unlooked for disaster have been discussed from various points of view; the superiority of the one power as compared to the other in the purely *military* services has been pointed out and acknowledged, yet I venture to think that sufficient attention has not been bestowed by speakers and writers in this country, upon the important part played by the *Administrative* or *Auxiliary Services*. I believe, therefore, it will be profitable to consider for a little what was the manner in which those services operated, what the extent to which they conduced to such opposite results in regard to the contending armies, taking my information on these subjects from published documents of various kinds.

Let us first glance at the condition of the *Administrative Services* in PRUSSIA. It is now well-known that for many years before the outbreak of the late war, Prussia had been engaged in the work of perfecting her military establishments; that this work had not been limited to matters of drill and parade, but that it included the branches of the service whose special functions are to provide for the physical support of the forces employed in actual conflict, and in the maintenance of their *morale*. In each



of these important services, such imperfections as actual experience in the field proved to exist were rectified from time to time, such alterations and improvements as experience showed to be necessary were made, the great importance of being *ready* for eventualities, being ever kept in view. It was this state of readiness that enabled her to gain the signal victories of 1866; it was this readiness that enabled her in that year to surround and force the dissolution of the army of a neighbouring power whose boast had been, even up to the moment when war was declared that her army was upon a footing of peace, in other words, without organization for the field, without commissariat, ambulances, or transport. It was this readiness on her part, that unreadiness on the part of her opponent which neutralised, as regards the latter, one of the most gallantly fought, and one of the most successful battles\* by small against large numbers recorded in the history of campaigns; and, let me add, it is this state of readiness at this very hour which to my mind renders a review of some points of her organization alike opportune and important.

That such changes and improvements in the working of the mighty military machine had special reference to the particular event which happened in 1870 may perhaps be matter of speculation. There is, however, no longer room for doubt that for two years prior to that date every necessary preparation for it had been made; that all was ready and complete when the storm-cloud burst in the month of July; and it is important for us to observe that among the preparations made, such matters as are within the province of the *Auxiliary Services* held an important place. Thus, soon after the conclusion of the Austrian war, General Moltke drew up a code of instructions for the *Etappen Inspektion*, and these had in 1868 been partly embodied in regulations. According to them,† an important part of the duty of this branch of the administration was "to watch over the replenishing of the operating army with men, horses, provisions, ammunition, and other military stores;" another, "to see to the removal into the interior, of the sick and wounded," and I solicit attention to the circumstance, that these duties are in the published instructions placed in juxta-position, thus indicating their relative importance according to the estimation of this very high military authority. We shall see presently how elaborate and how perfect were the arrangements for the execution of their objects throughout the war. Prussia has, indeed, been correctly stated to have been and to be the most aggressive State in Europe, enlarging and consolidating her kingdom at the expense of her neighbours and even of her friends. Her army has been the object of incessant study and improvement from the battle of Jena when the old system

\* Langansalza, 27th June, 1866. Lecture by Captain H. Brackenbury, "Journal of the United Service Institution," No. 68, of 1870.

† From the "Edinburgh Review," January, 1872.



collapsed to that of Sedan. The North-German armies are described as in the highest state of discipline that can be reached by scientific preparation for war;” but the point which concerns our present object mostly is that this high state of preparation includes “all departments, from the highest down to grave diggers, in other words, from the highest to the lowest;” that is, all are in “a continued state of readiness for war.” \*

Baron Stofell, in 1868 was well aware that the state of completeness and preparedness of the Prussian Military services was far beyond those of France. He distinctly stated that such was the case, in the reports furnished by him to his government, which have now assumed a veritable prophetic character, and he enumerated the several respects in which this preparedness was most apparent. These were—*a*, the readiness with which special corps admitted of being formed; *b*, the numbers in all ranks, of officers and men, thoughtful, well-educated, and judicious; *c*, the care with which the various services were improved from time to time as circumstances seemed to require, and, their completeness watched over by the King; *d*, and this is most important in its bearings—that no one branch of the military service should be deemed of greater importance, none of less importance than another; his Majesty keeping up the enthusiasm of all by his demeanour to the several officers; *e*, the high state of discipline, the energy and *morale* existing in all ranks of the army, and the readiness with which in the emergency of war the routine of the drill ground and demands of *Regulations* could be dispensed with.” The latter had indeed been dwelt upon even some years before Baron Stofell wrote. In 1860, Prince Frederick Charles† observed, “If Prussia puts herself this haughty question, What will be our fate in a war with France? We can conquer her with a certain blow, if we know how to detach ourselves from the routine of parade and regulations.” He added, “the motive power which these forces give is insufficient to maintain discipline, to bring soldiers up to the enemy and to make them maintain their fire.”

Here we have a distinct acknowledgment of the great power of *moral force*. The royal author just quoted, lays, “no stress upon tactics at all, but rather upon moral supremacy, arising out of a sense of power in the individual, and confidence in a sense of intelligent power on the part of their leaders.” Hence, the value in order to maintain this moral force, of *education*, sufficient to enable the men to understand the ultimate object of operations or manœuvres in which they are engaged. It is also necessary that the soldiers should have full confidence in the arrangements in existence for supporting them during the war in which they are engaged, and for their care if struck down by wounds or sickness.

\* The Army of the North-German Confederation. Translation by Colonel Newdegate.

† On the Manner of Fighting the French. London, Ridgway, 1866.



One more example of the general preparation of Prussia may be cited, namely, the perfect knowledge possessed by all ranks of the topography of the theatre of military operations. The importance of information of this kind has been acknowledged, and acted upon in a remarkable degree by Prussia, and not alone as regards the physical geography of France and other countries, but with reference to the customs of the people, the population, their degree of martial superiority, their religion, the number of churches, and other public buildings, the roads, rivers, bridges, military positions, and so on.

Much has of late years been said with reference to the relative qualities of old and of young soldiers for real war. In our own country, the point in dispute has not for a long time had an opportunity of being put to the test of proof; it is, therefore, of the greater importance that we should in this respect observe the system adopted by the Prussians. They, instead of filling their ranks with young uninstructed lads included in the "contingent" of the year, preferred to have none at all of these, but rather to possess in large numbers soldiers already made and fit to join their battalions. They preferred to place under the standards married men of thirty-five years of age and upwards, rather than send under fire young lads who had not completely undergone their military training; and as a result of this arrangement these remained at drill, while fathers of families fought in France.\*

On the subject of compulsory service, I restrict my remarks to its bearings upon *military efficiency* alone. I fear to extend them. Its results both in a social and domestic point of view are altogether another matter. Suffice it here to observe with reference to this method of recruiting armies, that it has been tried in former times, and found to be productive of evils of so gigantic a nature as upon public grounds to demand its withdrawal; that one of the greatest of King Alfred's benefits to England consisted in the abrogation of compulsory service, and the formation of a distinct class, namely, the Militia, the *levée en masse* being only had recourse to in great emergencies. Undoubtedly, in a military point of view, the system of compulsory service has important advantages. It provides to the army, men who are well brought up and well-educated, the sons of the gentry bring an immense influence to bear upon the soldiers of the inferior classes; it removes from the Army the stigma of social inferiority, and renders it what is its boast to be considered, "the nation in arms." In order that none but the physically fit should, however, be drafted into the ranks, the medical officers in charge of districts examine at stated times all those who are liable to military service, reporting to the several commandants the names of all such as on each occasion are found to be unfit. A similar examination is made whenever the order for mobilising the army is issued, a careful

\* *Revue Militaire de l'Etranger*, No. 36. July, 1872.



selection made of those who are in every respect physically fit for the coming fatigues, those only fit for ordinary service being retained in the reserves. The men of the Landwehr, who are married, and selected for active service, leave their wives and families chargeable to their several parishes.

Liability to military service includes not only men, but all horses. The animals used by private individuals are liable to be taken for purposes of military service, not even excepting those of medical practitioners. We read that in Bavaria horses were taken from the peasants' carts, forage for their support being carried away in large quantities at the same time, that there the poor people gave what they could willingly, under the promise that a fair valuation would be granted, yet that in 1873, they were still representing to the War Office in Berlin that this had not yet been done. No fewer than 40,000 horses were thus withdrawn from the population of North Germany in July, 1870.\*

"Voulez vous bâtir une armée? Commencez par le ventre; c'est là le fondement." This maxim was eminently kept in view by the Prussians. No sooner had war been declared than arrangements upon a most gigantic scale were made for supplying food and other necessities to the troops in progress to the front, and while engaged in the advanced positions of the army. The first concern of the Prussian administration was to establish stores of food, ovens, and bakeries, not only along the principal routes towards the frontier, but at important points along the course of the Rhine,† evidently with reference to facilities of transport. Within the district of each *corps d'armée* supplies for men and horses equal to their consumption during a period of six weeks were got ready and maintained, the troops advancing being, moreover, individually provided with reserve food, and the whole, followed by carts of traders with different kinds of provisions, all of which would be purchased at fixed but moderate prices. Magazines of food were provided at numerous smaller stations. As soon as circumstances permitted, each *corps d'armée* was furnished with a special provision train for itself, and within a very few days, fifty trains laden with food were sent from various parts of Germany to the banks of the Rhine.

In order that an idea may be formed of the enormous quantities of food it was necessary to provide for the troops, I would observe that after the Forces had entered France, the estimated quantity of food per *corps d'armée* per day included 18,000 loaves of bread of 3 lbs. each, 129 cwt. of rice or barley, 70 oxen, and 120 cwt. of bacon, 18 cwt. of salt, 1,000 lbs. of coffee, 3,500 quarts of arrack, and 3,500 ounces of bitter orange. Each horse was allowed 12 lbs. of oats, and 24 lbs. of hay or straw. Besides these articles, many others had to be provided to meet the daily requirements of the

\* *Revue Militaire de l'Etranger*, Nos. 73 and 75.

† As at Cologne, Coblenz, Bingen, Mayence, &c,



soldiers, including cigars, tobacco, stockings, flannel, belts, and clothing of all kinds, so that we read without surprise, but with admiration of the "innumerable trains of supply, food and provender, taking their place with baggage and ammunition;" that at one place there were miles of hay waggons, of bacon and beef waggons, horned cattle led by the score, and that in some instances the flood of invasion resembled the emigration of entire tribes in patriarchal times; at least, in so far that they seemed to be accompanied by their flocks and their herds."

But with all their resources, and all their carefully-arranged plans for securing ample supplies of food, the great object of the Germans was, with respect to the French, to follow "the simple rule—the good old plan—that he should take who has the power, and he should keep who can;" or in other, and perhaps more inglorious language, to make war support itself. We have heard of a similar system in former times. Nevertheless, there were occasions, early in the campaign, when, with all their precautions and care, the requirements of the troops were insufficiently met. Thus, it is recorded, that two days after the battle of Forbach, the supply trains were far in the rear; that during these two days the men had nothing to eat but a little bread; that they were wet to the skin, many of them ill, and that wet straw was all they had to lie upon. Being without tents, the rain extinguished their camp fires, the horses had no forage, and all this near their own frontier.

As the Germans advanced through France, "requisitions" by no means light were levied by them upon towns, villages, and individuals; families were forced to give accommodation, food and drink to such numbers of soldiers as the invaders chose to quarter upon them; and he alone who has seen the gastronomic capabilities of a stalwart specimen of their race can fully comprehend the import of what we understand as bed and board. It was otherwise with the British forces in India during the campaign of the Mutiny, and during the China war of 1860. On both occasions, the system of "requisition" was unknown, except as regards transport, and then payment was made at rates beyond those usually current.

Each German soldier, before beginning the day's march, had a cup of hot coffee; in halting during it, a well-provided canteen supplied a hot meal at a moderate expense. On entering a town or village, the bakeries and abattoirs were taken possession of, and sentries placed over them; the proprietors were furnished from the army stores with necessary implements; flour and cattle were then obtained by "requisition," after which, the wants of the troops in bread and meat having been completely satisfied, their authorities *permitted* the inhabitants to purchase what was left at fixed rates. The results are readily comprehended. They have been described by more than one *Correspondent*. According to



one\* from whom I quote, there were "a pitiful scarcity of food and sudden despair" among the peaceful population. The proclivities of the writer, it is right to observe, were altogether and unmistakably German. The army which marched from Metz on Orleans, a distance of 230 miles, started with all its trains full. It nevertheless lived entirely by requisitions, the trains being replenished three times on the road. The cavalry advance guard had with it officers whose duty it was to draw up "requisitions." These officers specified certain times, generally twenty-four to forty-eight hours, within which the supplies indicated by them in each town were forced to be collected and delivered at the stated places.

Nor was it only while advancing that the arrangements connected with *supply* were thus *systematically* conducted. Definite rules were laid down and rigidly enforced in regard to this service during siege operations. Taking that of Metz as an example, we read that "the subsistence of the investing force is assured first by the principal magazine of Remilly; second, the magazine of Pont à Mousson supplied in its turn by Remilly; third, requisitions should be made in a regular manner by the intendance, by means of cavalry, and as far as possible in rear of our lines. The zones of "requisitions" are determined with great precision, and *detachments sufficiently strong to ensure this service* will be sent to different points for the purpose.

Perhaps the full force and meaning of those instructions may become more apparent by contrast. For this purpose I transcribe the orders issued by the Duke of Wellington to the army entering France after Waterloo, dated at Nivelles 20th June, 1815. "It is therefore required that nothing should be taken either by officers or soldiers, for which payment be not made." "The commissaries of the army will provide for the wants of the troops in the usual manner, and it is not permitted either to officers or soldiers to exact contributions. The commissaries will be authorized either by the Field-Marshal or by the Generals, who command the troops of the respective nations (British and Prussian) in cases where their provisions are not supplied by an English commissary to make the proper requisitions, for which regular receipts will be given; and it is distinctly to be understood that they will themselves be held responsible for whatever they obtain in the way of requisition from the inhabitants of France, in the same manner in which they would be esteemed accountable for purchases made for their own government in the several dominions to which they belong." "Look upon *this* picture and on *that*."

We find that when emergencies and difficulties arose in regard to supplies of food, ample arrangements were immediately made in regard to them. For example, in the interval between the battle of Gravelotte and investment of Metz, the cattle collected

\* *Daily News Correspondence*, pp. 89—170—174—412.



from various quarters for the use of the troops became attacked with pleuro-pneumonia. Not fewer than a thousand of those affected were at once killed, and it became necessary to replace the food of which the troops were thus unexpectedly deprived. This was promptly done, the zone of requisitions was increased, requisitions were enforced upon the peaceful inhabitants without regard to any consideration.\* Mutton and pork were obtained wherever procurable; extensive purchases were made at available seaports of salted and smoked provisions; at Mayence, abattoirs and other arrangements were made for killing cattle and preserving their meat by means of salt, pepper, and partial smoking. As the armies advanced through France, depots of provisions were established at the large towns along the principal routes.

The actual amount of rolling stock in the shape of waggons with the armies to maintain their supplies as indicated was truly enormous. Thus there were attached to each *corps d'armée* four hundred waggons of two horses each, besides which the General Inspection of the Etappen had three hundred more at its disposal. The troops marched without tents. In bivouac they protected themselves by means of wind shelters and sheds made of straw, foliage, or other materials. During sieges and bombardment of cities, huts were erected for them. Each man carried upon his person his clothes and "bedding" so that the greater part of the transport was devoted to supplies and such stores as might become necessary, a large amount being of course devoted to munitions of war and warlike stores. In France, the soldiers of the army of occupation were billeted by choice upon the inhabitants, in order to keep up the custom among them of occupying an enemy's country. Accommodation for 1,000 men was only used by 500; each man had a separate locker; the quarters were littered with straw which served the purpose of bedding, and the occupied quarters were regularly white-washed. Further, it is on record that the War Office at Berlin realised a profit of one-third out of the sum paid by France for the daily ration of the men, this sum being assigned as a fund for the purchase of maps, payment of gratuities, prizes, &c.

During the late war, the use of *railways* by the Germans acquired a development heretofore unknown, not only for the transport of men and stores to the front, but for the rapid conveyance back to their own country, district and town of those struck down by wounds or sickness. In the beginning of the war they were made use of for two separate purposes; namely, during the mobilisation of the forces, for the conveyance of men from their homes to the place appointed for the supply to them of clothing and equipment, and thence to the rendezvous of the *corps d'armée* to which they severally belonged. Both these operations were completed on the tenth day from that on which war had been

\* *Revue Militaire de l'Etranger*, No. 61, of 1872.



declared, namely, on the 26th of July, and then began the work of concentrating the different armies on the frontier. A commission consisting of a staff and executive military officer, and of an officer of the railway, arranged the details connected with this service at each of the principal stations, all being subordinate to and acting under the orders of the chief commission at Berlin; the lines of the several States of the Northern and Southern Confederation associated themselves with those of Prussia Proper, and for the management of the whole, previously existing regulations were remodelled and adopted to the conditions of the emergency.\* The military administration of the railway service was placed under a general officer, and so long as troops were in progress along the lines or halting at the stations upon them they were considered to be under his orders, much as our own land forces are while on board one of Her Majesty's ships, in regard to the naval captain. Railway carriages of the third and fourth class were easily transferred for the conveyance of troops; partial arrangements were made according to whether trains were intended to convey to the front cavalry, infantry, or artillery. Two years before the occurrence of the war a complete programme had been drawn out as to the composition and size of particular trains, the hours of departure and arrival at stations, and the remarkable precision with which arrangements so long before laid down were carried out is now matter of history; two severely contested actions being† fought by the Germans on the thirteenth day from that in which strategic movements began. During these thirteen days there were conveyed by various lines 42,000 men per day, five principal lines being used for the purpose, so that on the 4th and 5th of August not fewer than five to six hundred thousand men were in position, with their equipment and supplies.

Troops were transported direct from their several starting points to their final destination; so were stores of all kinds, care being taken that neither men nor material belonging to different corps were mixed up together, or dispatched by the same train, although it often became necessary to take advantage of different lines, provided they concentrated upon the same point. As the Germans advanced through France, they took advantage of railways and rolling stock as far as it was in their power to do; on reaching Paris they established a chief Commission of Direction at Versailles, placing under it four other commissions, each at a chief city‡ in the occupied territory, assigning to each commission a group of railway lines. To insure the proper working of these lines, 3500 trained men were brought from Germany, and readers

\* *Les Chemins de Fer pendant la Guerre de 1870-71.* Par F. Jacquin, Paris. Hachette, 1872.

† Forbach and Froeschwiller.

‡ Viz.: 1. Strasburg. 2. Nancy. 3. Reims. 4. Chaumont. "*Chemins de Fer pendant la Guerre de 1870-71.*" Page 250.



may, perhaps, be interested to learn that the extent of the lines equalled 1600 miles, that the rolling stock included 1600 carriages brought from beyond the Rhine, and 4000 appropriated in France, all these being used for bringing up troops and stores, and for the transport back to Fatherland of sick and wounded.

At particular points along the several railways, refectories, at each of which hot meals were obtainable by the troops, were prepared and fitted up together with all requirements for personal comfort and convenience; at those places a regular system existed for collecting and slaughtering cattle, for preparing soup and boiled meat, of which the meals of the soldiers consisted, as also for quickly distributing them, the time allowed at each such place varying from one to three hours per train conveying 800 men.\* Special arrangements were made for sick, wounded, and convalescents, all of whom were conveyed in carriages specially fitted up for them; and the telegraph was freely used along the several lines to intimate in advance the times of departure from, and arrival at different stations. Another very excellent plan was, that trains conveying provisions contained a variety, so arranged that inconvenience to the troops in front would not arise from an accident befalling any one in particular. All these, and other arrangements were conducted agreeably to a Code of Regulations as minute in its nature, and as strictly enforced as were those of a purely military nature.†

Railways also fulfilled a most important part in reference to men wounded in battle. Not only were they employed as already mentioned, but where military movements, or battles, were imminent, trains suitably fitted up were sent along different lines, and to occupy particular positions like ordinary ambulances, they being provided with sufficient staff to attend to such wounded as should be brought to them for transport to the rear;‡ and there can be no doubt as to the great gain to the wounded themselves of such a system.

The arrangements connected with postal communication, partook of the general completeness of the other services of the German army. Correspondence between individual soldiers and their friends was rendered easy and frequent. Other matters than letters were, without stint, passed between them; thus souvenirs of various kinds from parent, wife or sister were transmitted with every care and regularity to soldiers in the ranks, and "Correspondents" allude to toasts of home and its associations, and songs recalling familiar places and friends that passed round isolated groups of German soldiers united in the dreary cold Christmas night of 1870 to share little articles of delicacy sent to them from their far off villages and hamlets,

\* *Chemins de Fer*, p. 82.

† *Chemins de Fer*, p. 88.

‡ *Edinburgh Review* January, 1872.



even as the army stretched itself around Paris, exchanging fire with the outlying forts and positions. The ties of home, thus never broken, had a powerful moral effect upon the soldiers. Each one knew that his deeds and conduct were anxiously watched, and made subjects of conversation within his social circle; thus the natural pride which all men feel in being well thought of was brought into play, nor can it be questioned that to this circumstance, brought about by good and thoughtful arrangements, the high state of discipline of the army, as a whole, was in no inconsiderable a part due.

The improvements effected in the working of the Army Medical Service in Prussia have, to a certain extent, kept pace with those introduced into other departments, and, perhaps, such further advances in organisation as the late war has shown to be necessary, are even now being considered for early adoption. As matters stood in 1870—71; it was infinitely superior to that of France. For years before, on the occasion of each annual mobilisation of the Prussian Forces, it had been the custom to practice the Medical Services in regard to their working in the field, to thus keep them habituated to foresee contingencies, and prepared to take their places complete, whenever the exigencies of actual war should require them to do so. There are two respects, however, in which the experience of the late war indicate room for improvement to enable sick and wounded in the field to obtain the amount of help that medical and surgical science is capable of conferring upon them under more favourable circumstances. The service was, as yet, but partially emancipated from the Intendance, while there is another element which, in reality, tells more directly against its efficiency than even the Intendance, namely the *Johaniters*, men of no special training for hospital duties, of high social position, without actual responsibility in regard to the success, or failure, of professional treatment, yet who fetter surgeons in their duties, and it is said appropriate credit that is due to those with whom rest the technical knowledge and the responsibility.

Arrangements for the reception of the wounded were made upon a very extensive scale. In the capitals of provinces, cities and towns, at the chief railway stations, and, as we have seen, along the different lines of communication, hospitals and buildings, suited for the purpose, were fitted up with this object; huts were erected, tents pitched, *matériel* and *personnel* for all being provided, partly by the War Department, partly by Societies under the "Red Cross," partly by individuals; but all such being in addition to, and supplementary to the establishments with the active army.

In Prussia, during times of peace each *corps d'armée* has its own principal medical officer, whose duties extend, not only to the troops and surgeons of the active forces, but also to those of the



reserves. He preserves correct lists of all surgeons in civil life residing within his district who are liable to serve on the occurrence of war, and keeps a record of their several qualifications; when war is imminent, an appeal is made to civil practitioners and retired army surgeons to give their services, and they are appointed for the time being, in the proportion of 1 surgeon to 190 men in the active army, or including the Landwehr, 1 to 290. In addition to these, a private surgeon of eminence is attached, as consulting surgeon to each *corps d'armée*, brevet inspectional rank being conferred upon him while so serving. His functions consist in giving professional advice in complicated and difficult cases, in performing the more difficult operations, and in meeting the executive surgeons in consultation whenever requested by them to do so. The advantages and importance of an appointment such as this must be obvious. Responsibility is in a considerable degree taken off surgeons of the army, their time is saved, treatment of individual cases is facilitated, and the relatives of the wounded, whether officers or men, are satisfied that they obtain the benefit of the highest professional skill.

Another point of excellence deserves notice. Not only are the men employed as *brancardiers* or *infirmiers*, carefully trained for their particular duties, but great care is taken that soldiers selected for the duty are men of at least moderately good education, respectable in social position, and moral in character. Inducements are held out to them to make hospital nursing their profession; their pay is good, they have the prospect, after passing a suitable examination and serving a definite time in the army, of receiving certificates as *gardes malades*, and being appointed in that capacity to hospitals and asylums in civil life. On active service, in addition to the *brancardiers* of the ambulances, each company contains four men whose duty it is to fall out during battle, and assist in conveying wounded to the first line of assistance, they returning to the ranks when not thus required, and then performing the ordinary duties of soldiers. These men are regularly trained for their duties on the field, they wear a distinctive badge, their employment removes all cause or excuse for soldiers while engaged in combat quitting their ranks on the plea of assisting a wounded officer or comrade, and accordingly, such a practice is very strictly prohibited.

The regimental surgeon accompanies his regiment into action. With and under him are the *krankenträger*s (brancardiers) of companies, trained to apply first dressings, and to carry a wounded comrade. The *Sanitäts Detachment* is formed under the orders of the divisional surgeon; it is commanded by a captain, aided by a lieutenant. The *krankenträger*s advance by twos in indicated lines, each couple carrying a stretcher. They collect the wounded as rapidly as possible, and convey them to the place where the ambulance carriages have been halted; the surgeons remaining with



the waggons apply the first dressings, according to necessities, and this done, the conveyances drive off *at a slow pace* to the nearest house, or other shelter where the field-hospital has been established. I have purposely noted that the pace of the conveyance is *slow*, because in the fact of its being so lies a great fault in our otherwise efficient field system. Unfortunately, slowness is rendered necessary by the heaviness and clumsiness of the conveyances, whereas the necessities of a soldier, whose limbs have just been shattered, demand that the means of transport be both light and elastic. This was fully acknowledged during the American war, and some of the improved carriages used in it were as light and well finished in construction as if they had been built for private use—such as were employed in Paris were well horsed, and much to the advantage of the wounded, they were usually driven from the battle-field along the streets to the fixed ambulances at the rate of nine miles per hour, and upwards. And such are the carriages we require in European warfare.

But let us follow the German routine a little further. The waggons, when unloaded, return for more wounded, for whom the search is prosecuted until every hedge, ditch, quarry, and hole has been carefully examined. When the wounded are brought to a temporary hospital, they are placed side by side, the surgeons after having given each the requisite attention, affixes to a button hole a card, upon which he writes the nature of the wound, so as to render subsequent exploration of it, and consequent suffering to the patient, as far as possible, needless. As the *corps d'armée* moves forward, the wounded are transported to the regular field-hospitals; and every man whose condition admits of further transport, is conveyed to the nearest available railway station, and thence dispatched in suitably arranged carriages to their own country, or to some intermediate point where ample arrangements have meantime been made for them.

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## PART II.

### FRANCE.

In August, 1806, Prussia sustained in the battle of Jena a defeat by the armies of France nearly, if not quite as great as that which little more than half a century afterwards she inflicted upon the latter; the whole kingdom lay at the feet of the first Napoleon, who entered Berlin in triumph within a month after he had declared war. From that date, France had till 1870 continued to be looked upon as the model military nation of Europe; she had, it is true, met with several great defeats and reverses in the interval, yet her military reputation continued to hold its high position; her organization was everywhere looked upon with admiration; in many respects it was more or less completely adopted or copied by some other countries, our own among the number; and it is now indisputable that when the late Emperor declared war, all but a very few of the initiated were fully prepared for quick and easy success of his troops. But within a very few days from that time confidence began to fail. As events followed fast upon each other, it became more and more apparent that "the fortune of war" had turned against France in favour of her old and implacable enemy, and before her final overthrow, the admirers of her old *régime* asked themselves the question, By what means has it come about that the once glorious army of the great Napoleon, which under him had marched victoriously to almost every capital in Europe, is now "crumpled up," as it were, by a Power which scarcely dates beyond the present generation?"

In my previous paper I endeavoured to indicate some of the respects in which Prussia, *profiting* by the great defeat she sustained at the beginning of this century, had *set her house in order*, and also to point out in what manner she has from that time gone on perfecting her own arrangements, as each *trial* in which she has been engaged showed the existence of defects to be corrected or suggested improvements to be adopted. I have evaded purely military details, and intend to do so now, they being beyond my sphere and scope of this paper; yet it is obvious that there are points at which the consideration of the *non military* or *administrative services* touch the military or combatant so closely, that it is difficult to say precisely where the limit should be drawn.



It will be remembered that Napoleon the First divided the services connected with war into two very separate and distinct branches, namely, that of command and that of administration; in other words, that of the generals and that of the intendants. Under him, *centralisation* was at its maximum; but then he himself, the *centre* and ruling power of the whole machinery of war, alike military and administrative, was ever present where the requirements took place, or delegated adequate powers to generals in command of independent forces. Military organization in many of the armies against which he contended had, moreover, not attained the perfection of that established by his great genius. But, as events have amply shown, the organization which enabled him to obtain his successes, and, it may be added, to recover from his defeats, did not in subsequent years advance with the changing conditions of the times, nor keep pace with those improvements and preparations which Prussia was steadily although silently prosecuting. Not that there were no counsellors to give warning against the dangers of false security. There were several, more especially General Trochu and Baron Stofell. For some time before the fatal year 1870, they had raised their voice of warning; their writings now declare the correctness of their views, but no explanation appears as to the causes which led to those views not having been acted upon, nor of the apathy which seemed to stand in the way of the most ordinary precautions against such an emergency as then occurred. Nations, like individuals, sometimes profit by the misfortunes of their neighbours. We have just seen that Prussia, out of her disasters in 1806, has reaped the transcendent successes of 1870; there may, therefore, I trust, be profitable instruction to be reaped from the detail of France's unpreparedness, which I now proceed to give.

General Trochu,\* writing in 1867, dwelt upon the decadence which, since the days of the First Empire, had taken place in the conditions of the French army, going so far as to look upon the fate which soon afterwards actually befel that army as being a very probable contingency. "During peace,"—such are General Trochu's words—"the exigencies of war had been lost sight of; the army was only kept up for peace; the *administration*," he adds, "is perfectly honourable, but it is not constituted with reference to the requirements of war, where, in a certain sense, it acts in opposition to itself." During the war in Italy, improvements shown in that of the Crimea to have been needed, had not been introduced into the administrative services.† The events of 1866 further indicated the existence of serious defects. Changes had subsequently been contemplated and partly introduced; nevertheless a staff officer‡ thus alludes to the state of those services in

\* "L'Armée Française en 1867," p. 168.

† Speech of M. Rouher. Also *Quarterly Review*, No. 129, of 1870.

‡ "Considérations Générales sur l'Etat Militaire de la France," par M. Nuques, Lient.-Col. d'Etat-Major.



1869, that is, the year immediately preceding the outbreak of the war. According to him, "the wars in the Crimea and in Italy had demonstrated that the military system of France neither answered the requirements of the country nor the position it should maintain in the world; that although nothing of importance had been done to improve its conditions, the events of 1866 had given to a neighbouring Power success unprecedented, and aggrandisements the ulterior limits of which had not yet been attained." General Trochu further observes that so rapidly had partial changes been for some years made in the system of administration of the army, that the different services connected therewith "had ceased to be conducted in accordance with simple definite regulations readily comprehended by all; that although many of the regulations had been prepared by men of talent, their only nature indicated that their authors were either unacquainted with actual war, or if personally acquainted with it, had insufficiently observed its requirements or profited by its lessons." Of the regulations in force, some were contrary to others; officers charged with their execution were placed in doubt and difficulty; the routine which worked tolerably well in peace was inapplicable to the emergencies of war, where emergencies take place suddenly and unexpectedly. "France had, indeed, been turning out her Chassepots and mitrailleuses; it is even asserted that she had done something to raise, arm and drill her soldiers; but *something* beyond all these was needed, and in *that* she was deficient. This something has been well described as the *mechanism* of an army, composed of numerous and diversified wheels, for the successful operation of which it is necessary that they shall work in harmony." Without this *harmony* between the different parts of a military machine, successful working becomes an impossibility.

Baron Stofell\* had also pointed out at various times between 1866 and 1869, that serious defects existed in the administrative services of the French army as compared to those of Prussia; nevertheless, with all his great talents for correct observation, he was only partially aware of the extent to which, as proved by subsequent events, defects really did exist. Taking his reports in the order in which they were made, we find that first among the defects he alludes to is the imperfect organization of the medical service, and the want of a special corps of bearers of wounded men from the field of battle (p. 2). He then points out the inferiority, intellectually and in education, of men and officers in the French army, as compared with those classes in the Prussian (p. 11), and condemns the system of *substitutes* so demoralising, not only to the army, but to the nation itself. He adverts to the absence of special corps for railways and telegraphs; and in 1868,

\* Military Reports addressed to the French War Minister by Colonel Baron Stofell, Translated by Captain Home, R.E. 1872.



he wrote: "During the past fifteen years we have had two great wars; what military instruction have we obtained from these wars?" "Have we," he asks, "sought to perfect one of our institutions, to reform one of our services?" (p. 85.) He points out as deserving of adoption, the system of *inspecting* army corps pursued in Prussia, the object of which is "to ascertain the amount of fitness for war that the troops have attained." In August, 1869, he considered that war was inevitable, and, moreover, that France, "by her ignorance of the state of affairs, has not the same foresight as Prussia" (p. 135); nor does he omit to draw in bold terms a contrast between the moral conditions of the two peoples, consequently of the armies of France and Prussia (p. 142), giving to each its due importance as an element of military failure and of military success. In all this, not a word has occurred about actual combat. Events soon proved that where gallantry and pluck of contending forces in battle are equal, it becomes necessary to seek in some other elements the causes by which the issues of campaigns are decided. I believe, therefore, that from this point of view the war of 1870-71 is capable of furnishing many important lessons to such as are prepared to receive them.

When war was declared, and the French forces mobilised, the fact at once became apparent that important defects existed in the system of enumerating actual effectives in that army. Discrepancies existed between the numbers of men and horses, as shown upon paper and as they actually were. The infantry was deficient to the extent of 70,793 men, the cavalry 6,409 horses, there being a surplus of 5,816 men; the artillery was deficient in 705 men, 2,957 saddle and 9,313 draft horses, besides 11,154 horses and 708 mules lent to farmers; the engineers required no men, but were deficient in 1,308 draft and 540 saddle horses; the general staff was deficient in 54 officers; the military train to the extent of 3,700 men, 1,640 saddle and 9,019 draft horses; the army service corps to that of 3,000 *ouvriers d'administration*, and 300 *employés d'administration*, besides 80 officers of the administration, 56 of the intendance, and 900 infirmiers. At first sight it is difficult to account for such deficiencies. The circumstance has transpired, however, that in the *total* of troops shown by the *Returns* of July, 1870, to exist, were included 24,000 *gens d'armes*, dépôts, 28,000; home garrisons, 78,000; Algeria, 50,000; making a total of 230,500 men who were unavailable for purposes of war, although borne upon the rolls of effectives.

When the emergency of war actually occurred, and the army had to be increased, men drafted into the ranks were, as often happened, sent great distances to the dépôts,\* where alone they

\* To further illustrate what is indicated in the text, I may observe that only 35 out of 100 infantry regiments were in the same garrison as their dépôts. The 87th Regiment was at Lyons, its dépôt at St. Malo; the 98th at Dunkirk, its dépôt at



could obtain their clothing and equipment; such dépôts being situated in Paris, Lyons, Metz, Strasbourg, Perpignan, Montpellier, &c. Much time was thus lost; the men once equipped, had in many instances again to perform long journeys; proceeding to join battalions which had in the meantime left their stations, and gone, in some instances at least, to join divisions to which a different rendezvous had been appointed. Conscripts of insufficient *physique* were by the *Conseil de Revision* passed as fit for service, irrespective of the opinion of the examining surgeon; old men and substitutes also filled the ranks; many were infirm, low in stature, half worn out, uneducated, and prone to indiscipline. Men thus suddenly brought together from distant points were strangers to each other; regiments received numbers who knew not how to handle a musket, to say nothing of a Chassepôt rifle, and yet such men in some instances were sent into battle the very day they joined. *Corps d'armée* consisting of such materials rapidly thrown together were without cohesion; one portion of their administration without knowledge of how far deficiencies existed in others, nor was there time for the necessary knowledge and co-operation to be attained before actual operations began. The very principles laid down by Marshal Bugeaud had been ignored by the authorities who accepted his works as text books. "If," said he, "principles of action have not been fixed upon beforehand, how can their application be ensured in the moment of danger? We must not trust ourselves to chance inspiration in regard to matters of importance; we must act according to principles." And he continues, "The same men should as much as possible perform the same duties; they should know in advance what will be required of them, and how to perform it; thus error and hesitation will be avoided." "It is incontestible that the manner in which the military machine works at the opening of a campaign determines to a great extent the manner in which it sustains itself throughout its course."\*

When divisions marched, the men were nominally supplied with rations for four days' consumption; in reality, however, they often had not sufficient for one. There was but one place of issue for each division; troops began their march in the early morning, and although the actual distance traversed seldom exceeded ten miles, and at times not more than five, they did not reach the halting place till late in the afternoon; many men had dropped behind from weakness, hunger and fatigue. The place of issue of the rations was of necessity at a considerable distance from the great body of the troops; parties of men detailed to draw and distribute them performed their duties reluctantly and imperfectly; Lyons. Every soldier not actually serving had to proceed to his dépôt for clothing, and then be re-conveyed to his regiment. Further, the dépôts themselves needed in several instances to be supplied with articles of equipment.

\* De Ternay, quoted by Lewal, "Conférence sur la Marche d'un Corps d'Armée," pp. 7 and 9.



soldiers strayed in search of food they were unable to obtain in a regular way; houses were robbed and pillaged; trains of provisions were seized and robbed by bands of two and three hundred of all arms; the roads in some places were strewn with broken-open chests of biscuits, salt pork, Italian pasties, and cartridges; officers' trunks were forced and plundered, and there is reason to fear that in some cases officers lost their own lives. Intendant-General Vauchelle\* had well expressed the fact when he observed that "without assured subsistence, an army can undertake nothing;" and how was the truth of his axiom being confirmed?

When regiments were ordered to take the field, they were unable to obtain even the conveyances allowed to them under ordinary conditions, for as these were in park at Satory and Vernon, instead of being kept ready and available at the head-quarters of corps and divisions, it was impossible to make them available when most needed. For all practical purposes they might as well have been non-existent. Nor could other means of regular transport be obtained in sufficient quantity for the conveyance of food and stores. Carts and horses were accordingly requisitioned. Both were alike ill-suited for their purpose; the carts broke down, horses gave in; constant delays and interruptions on the line of march were the result. Yet nothing can appear more complete than the Regulations on the subject of Transport. Napoleon the First well knew the importance attached to it. As expressed in a code of Instructions issued under his orders, "The transport service is most essential to the success of an army, and often even to its preservation." "The transport service is the soul of an army, to which it of itself communicates life and movement." "The success of operations and the honour of the administration nearly always depend upon it."† Supplementary means of this description must, as a matter of course, be always engaged. "The idea," says M. Vauchelle,‡ "of creating a system of transport sufficiently large to meet all requirements connected with food and supplies for an army on service, would never enter the mind of any reasonable man, much less that of an enlightened administrator. Supplementary means have ever been required, but then they must be well chosen, and efficient for their purpose."

It will be remembered that on the 15th of July, 1870, war was declared in the Senate and Corps Législatif. On the 18th of that month it was reported officially from Bitsche that the military chest at that place was without money. On the 20th, the Intendant-General at Metz telegraphed that the troops had neither sugar, rice, coffee, nor salt, and very little of either pork or biscuit. On the 21st, the officer in command at St. Avold reported that he had large quantities of useless charts, but was without one

\* "Cours d'Administration Militaire," Tome II., p. 174.

† Vauchelle, Tome III., p. 322.

‡ Vauchelle, Tome III., p. 333.



of the frontiers of France; and on the same day a brigadier at Belfort reported that he had arrived there, but was neither able to find his brigade or general of division; he asks for orders, as he knows nothing of the whereabouts of his regiments. On the 24th, the general officer at Thionville is without *cantines*, ambulances or waggons, and the Third Corps at Metz had neither engineers of the administration, bakers nor butchers; no ambulance-carriages, no medical officers. On the 25th, neither biscuit nor salt meat existed at Mézières; several battalions of National Mobile Guards arrived at Chalons camp unexpectedly, without arms, camp equipage, or utensils; without blankets or any other requirements for service, many of them also destitute of food; and the result was "demonstrations on the part of the citizen soldiers of a very dangerous nature." On the 26th, bakers and butchers not having arrived at Metz, the troops had to eat the biscuit that should have remained as a reserve for 12,000 men. On the 27th, there existed at the same place no tents for the use of troops arriving; and on the 29th, biscuit was needed to enable the men to march forward. Camp equipment, blankets, water-vessels, and mess-tins were deficient in quantity.

Early in August, the officer commanding the 7th Corps at Belfort was without engineers, army service men, or *train*. On the 7th, wine, brandy, sugar, pork and vegetables were urgently required at Verdun. On the 8th, there existed at Chalons camp neither a ration of biscuit nor food for the field, with the exception of sugar and coffee. On the 10th, many fugitives, sick and wounded, were arriving in that camp from the battles which had already taken place nearer the Rhine; there were still no cooking tins nor water-vessels in camp; palliasses and shirts were deficient in quantity. On the 11th, the military authorities at Strasbourg were without money to pay for food or comforts needed by the wounded, distributed among the neighbouring villages.\*

Direction and administration were concentrated in Paris. Everything had to be obtained from the capital. The various departments of the Ministry of War were suddenly overwhelmed by the number of telegraphic and other dispatches arriving from the provinces; the existing stores of material of every kind were rapidly exhausted, nor could further supplies be prepared in sufficient time to meet subsequent demands. When defects were discovered in equipment and supplies of forces at a distance from the capital, it became practically impossible to furnish them in time; thus for the purposes of war many of the stores in Paris, alike of military as of other material, could not be brought into use.

The absence of organization in regard to railways deprived the Government of the full use of these for purposes of transport. It is true that 186,000 men and 32,000 horses were by these means

\* Livraison XIV. Correspondance de la Famille Impériale.



sent to the front, and that, trusting to railways, the ordinary roads were made use of to a relatively small extent; yet the wonder is, how under such circumstances even this could be effected. The actual state of the railway service is thus described: "Everybody issued orders; the officials of the several lines received contradictory directions, first from one quarter, then from another, many of them of such a nature as to be impracticable of execution."\* Infantry, artillery and stores were dispatched by the same train; fragments of different corps and divisions sent together; officials at intermediate stations hurried off trains without reference to the state of the line at more distant points; arrangements were insufficient for supplying the troops proceeding by train with food, or for meeting their other natural requirements; at some stations the railway servants were absent—they had, in fact, ran away; means of signalling were deficient, while at some of the larger *termini*, notably at Metz and Strasbourg, "the state of confusion was beyond conception except by an eyewitness." Special arrangements of carriages and trains for the transport of sick and wounded were non-existent, nor were they introduced by the *administration* throughout the war, although the *Société des Secours aux Blessés* tried in some measure to supply this defect.

It seems hardly necessary to observe that while in war it is essential to success that the physical conditions of troops engaged shall be maintained at the highest possible point, it is no less essential that their *morale* shall be so also. So convinced was Napoleon the First of the importance of maintaining the *moral force* of armies, that he even placed it before the physical. "Moral force," he observed, "constitutes three-fourth parts to success, while physical force constitutes one-fourth." Let us now see what effect upon the troops in this important respect had the conditions we have glanced at. The soldiers were not slow to observe that although they were being hurried towards the Rhine, the real requirements for offensive operations were absent. Their *physique* had already suffered considerably, in consequence of privations, fatigue, and exposure; their *morale* became further depressed by the sad and dejected looks of the sick and wounded whom they saw in their ill-provided hospitals; and under such conditions did the first great battles of the campaign take place.

But the defects in the administrative services now related had also a most important bearing in reference to the military results of the campaign. The plan of that campaign, according to *La Liberté*, was intended to include a rapid advance upon Hesse, to neutralise the South German States, occupy Frankfort, sweep the Prussian territory on the left bank of the Rhine, enter Westphalia, and, being supported by Hanover and Denmark, drive the Prussians beyond the Elbe, and subsequently re-construct the

\* "Chemins de fer pendant la Guerre de 1870-71," par F. Jacqmin.



German Confederation, to the exclusion of Austria and Prussia. Be this as it may, the object of the French Emperor is well known to have been to attack the German forces before the latter should be able to complete their concentration. The fact presenting itself that needful supplies were wanting, the administrative services defective, delay, unavoidable under the circumstances, was resolved upon, in the hope that those services might be able to extemporise in the emergency what was defective and deficient. The German forces, complete in every respect, their administrative services in perfect order and accustomed to their work, had meantime effected their concentration. The French had to scatter their divisions, not for military reasons, but in order the more readily to obtain supplies along different lines of railway; the plan of the campaign, before a blow had been struck, was changed to one of defence; portions of their now separated corps were attacked by the Germans in superior numbers; defeat followed defeat; cohesion, never complete, was destroyed; the disaster at Sedan, and finally the capitulation of Paris itself succeeding as natural results. "The absence of prevision resulted in national disaster."

Men exposed to the casualties of battle must feel satisfied in regard to, and have absolute trust in the completeness of arrangements for, and in the fitness of persons to take charge of them if struck down by wounds or sickness. They must be made to feel that by the side of the arm to strike is that to heal, or at least to give such aid as may be possible. This fact has been recognised by great conquerors and generals in all ages. In the wars of France during the 16th and 17th centuries, it was acknowledged and acted upon, yet strange although it be, neither the first nor third Napoleon bestowed that degree of consideration upon the sick and wounded of their armies which humanity and policy rendered desirable. It has, indeed, been remarked, and a similar observation might be applied in respect to another country than France, that on the occasion "of each war, those who are pompously named the guardian angels of the sick and wounded soldiers are courted and exalted; after the war they are regarded as the costly agents of a nearly useless service."\* The subordination of Medical officers to the Intendance had been continued, notwithstanding the urgent representations made on the subject; the results were that a falling off of the number of candidates on the one hand, and increase of retirements on the other, had produced a paucity in the ranks of the *service de santé* to an extent most injurious to the interests of the soldier.

We have seen some of the respects in which it was defective in the French army in the war of 1870-71, but the story remains to be completed. Not only were establishments of ambulances deficient in *personnel*, according to scale laid down in Regulations,

\* "Le Service de Santé des Armées avant et pendant le Siège de Paris, p. 28."



but in some instances divisions of the army were absolutely without ambulances. Harness for ambulance horses having to be obtained from Metz, was wanting to a great extent. Brancardiers to bring the wounded from the field of battle, and infirmiers to attend upon them in hospitals, were insufficient in numbers and without qualification for their duties. Men who could for the time being be spared from other branches of the *administration* were utilised for the purpose, but as similar deficiencies existed in all, few men, and often none, could be spared. Musicians and soldiers from regiments were "told off" to perform the duty; others quitted the ranks during actual combat to accompany, in bodies of eight, ten, or even more,\* a wounded comrade. Difficulty was experienced in getting these men to resume their places in the ranks. Experience indicates that those who have to continue in battle should see as little as possible of the havoc made in killed and wounded; thus it was found that such men as did rejoin after having seen the wreck were in a less favourable state to continue the work of fighting than if they had been uninitiated in such details.

Surgeons of the army were insufficient in numbers. They were sent by the Intendance to particular ambulances, not necessarily informed as to the state of completeness or otherwise of such ambulances, and not seldom to find them absolutely destitute of the means of preserving life; without surgical instruments, chloroform, appliances, or medicines. All such articles could only be obtained from Paris. Communication with the capital being soon cut off, it became impossible to obtain necessary supplies. The devotion of individual surgeons was great, as it always is under such circumstances; but what signified that in the absence of means? In some cases, soldiers had to undergo amputation of wounds shattered in battle by means of butchers' knives and common saws.† Wounded men were transferred from ambulance to ambulance by the Intendance, without reference to the opinion of medical officers; surgeons were without voice in the distribution of the wounded, the numbers placed in particular apartments or in regard to other hygienic arrangements connected with them, and the results were the outbreak in nearly all ambulances of hospital gangrene and pyemia. In other instances wounded were moved from ambulance to ambulance in unsuitable conveyances, unprotected from the weather, insufficiently fed, and without proper attendants. In fact, "constant confusion, weakening of the exertions of surgeons, considerable mortality and suffering for all, patients and surgeons; such was the result of the organization, or rather dis-organization of the *Service de Santé*, under the high and incompetent direction of the military *Intendance*."‡

\* At the battle of Montretout on the 19th January, 1871, I myself counted thirteen men coming to the rear with *one* wounded soldier.

† Report of Brit. Nat. Soc., p. 17.

‡ M. Le Fort, *Chirurgie Militaire*, p. 123.



## CONCLUSIONS.

Is the question asked, What are the conclusions I desire to draw from the remarks I have ventured to make in regard to the *administrative services* during the late war? What the lessons to inculcate? I would briefly summarise both.

Undoubtedly physical force must ever decide the result of a campaign. In order, however, that it may do so, it is essential that arrangements are complete for bringing it to bear upon a particular point at a definite time. Inasmuch also as an important element of this physical force is composed of reasoning and thinking men, who require to be fed, clothed, and generally taken care of, an important item in relation to their management is to maintain in them those sentiments of trust, confidence and order which together constitute the *morale* of a force. We have seen what are the views entertained by great commanders on this point. Prince Frederick Charles lays "no stress upon tactics at all, but rather upon moral supremacy." "Moral force," said the First Napoleon, "constitutes three-fourth parts to success, while physical force constitutes one-fourth;" and, I may observe, Marshal Bugeaud has stated the results of his experience that "it is easy to bring soldiers to the fire, but difficult to maintain and preserve them there." I therefore venture to observe that the teachings of the Franco-Prussian war seem to me to have been studied in this country too exclusively from a military point of view, too little from an *administrative*.

With regard to the *human material* of the contending forces, there were unquestionably important differences, *moral* as well as physical. With the Germans, this moral force combined the sentiment of national pride, love of country, solicitude for its interests and honour, in addition to the great military principles of devotion, self-sacrifice, discipline and good order; all these giving unity and strength to their organization. In France, her own writers observe that the feeling of patriotism had fallen asleep; that, masters of their own unity for two centuries, they had ceased to think of conquest from without, and that when war was declared against her old enemy, popular enthusiasm failed to be aroused thereby. It is allowed that in this general decadence military discipline had become relaxed to a serious extent; but in and beyond the army, the three great moving principles of life were absent: "respect to God, honour, and country."

In the armies of Germany was united the manhood of the country. In those of France, only a portion of her manhood, consisting of the poor and even the less desirable among them. A large number of the German troops were practised in and inured to war, physically strong, of mature years, and in all respects ready prepared for actual service. Those of France were in a large proportion immature, inexperienced, uninured to active service, un-



prepared for war, and without knowledge of what was required for its emergencies. With the Germans, *cohesion* and *confidence* extended through all ranks; with the French they were non-existent.

In Germany, preparations had been carefully matured and arrangements made *years* before, in reference to the eventuality of a war with France; officers of all grades and *departments* had learnt what were the precise positions they should occupy, what the duties they should fulfil. The soldiers, in like manner, had learnt by actual practice the precise steps each had to take, whether in the active ranks or reserves; arrangements were ample and in working order for their rapid supply with clothing, equipment, and other requirements, as well as for their conveyance along the different stages of their mobilization. In France, traditions of former times retained their sway. Corresponding preparations to those just mentioned had not been made; when the emergency of war occurred, neither officers nor men knew from practice what was required of them, and as we have seen, instead of mobilization and equipment of forces proceeding regularly and systematically, according to pre-arranged plans, all was hurry, confusion, and incompleteness.

With the Germans, the two great requirements of armies, namely, *food* and *transport*, were ensured and provided for with a degree of care and a completeness of organization hitherto unequalled in war. Above all other considerations was the importance of supplying the active forces with ample and good food; the next, that of maintaining communication and means of transport of all kinds between the advancing *corps d'armée* and the "mother country." In the case of France, the means of *feeding* the armies, by no means perfect or sufficient in themselves, were further impaired by the absence of prevision and organization in regard to transport and communication.

In the case of the German forces, very complete arrangements existed for maintaining communication between soldiers and their homes. Thus, domestic ties were never absolutely broken, nor the influence of home and friends forgotten: soldiers as they advanced and fought felt that their conduct and fate would form the matter for conversation in their several villages. And it is recorded of them, that the circumstance formed a powerful stimulus to bravery and good conduct on their part.

Unhappily it does not appear that any thing corresponding to this existed in regard to the soldiers of France. Except under the organization of *Red Cross Societies*, there is no record of special facilities being afforded for communication between them and their homes, and naturally the arrangements made by these Societies had reference, more particularly to the sick and wounded. If, therefore, as we have seen, the existence of such arrangements on a large scale was productive of the great *moral* results we have



quoted, it is equally clear what were some of the consequences which arose from their deficiency or non-existence.

Allusion has been made to the necessity in a *military* point of view, as well as from that of humanity for providing ample means under a special organisation for sending the wounded from the field of battle, conveying them to ambulances and hospitals, and for their proper attendance and care while there. If soldiers, whose purpose it is to fight, are employed after battle in traversing the field, removing the wounded and burying the dead, experience has sufficiently proved that they are less morally fitted to take part in subsequent fights than are those who have not had an opportunity of witnessing the carnage of battle; moreover, so long as life and suffering are matters for consideration, it is absolutely essential that only men carefully trained for their duties should have care of wounded, whether in progress to, or in the hospitals. With the Germans these principles were fully accepted and acted upon. Whether as *krankenträger*s, or as *infirmiers*, men so employed were carefully trained for the purpose; they had, in addition, special inducements held out to them for continuing, while in active employ, the duties connected with these vocations, knowing that openings for employment in other positions existed for them when, on the completion of their service, they returned to civil life. In the case of the armies of France, it is sufficient to indicate that the *personnel* officially employed as *brancardiers* and *infirmiers* was neither by training nor qualification fitted for the efficient performance of its important duties.

Lastly, in order of enumeration, but by no means so in importance are the medical services of the contending armies. That of Prussia, although by no means so perfect as it might have been, had been considerably improved since the war of 1866. The principle was fully acknowledged, that it was the interest of the State to provide for the soldier, who fought its battles, the best professional services that could be obtained, and to afford them, when sick and wounded, the most liberal treatment in every respect. The medical staff was both numerous and effective, ambulances and other sanitary establishments were carefully and amply supplied with all requirements, and *on actual service*, the medical officer was supreme in all that concerned the care and proper treatment of the patients. Even since the war ended, improvements, shown to be necessary in this service, have been introduced, rendering it, for its purposes, perhaps the most complete of any existing army. In the corresponding service of France, the professional care of the sick and wounded remained "a subaltern service"—subordinate to and ruled by officers necessarily ignorant of its requirements. Not only were medical officers with the armies in insufficient numbers, because candidates held aloof, and those who were able to retire did so, but such as accompanied the forces, chained as they were by routine, were

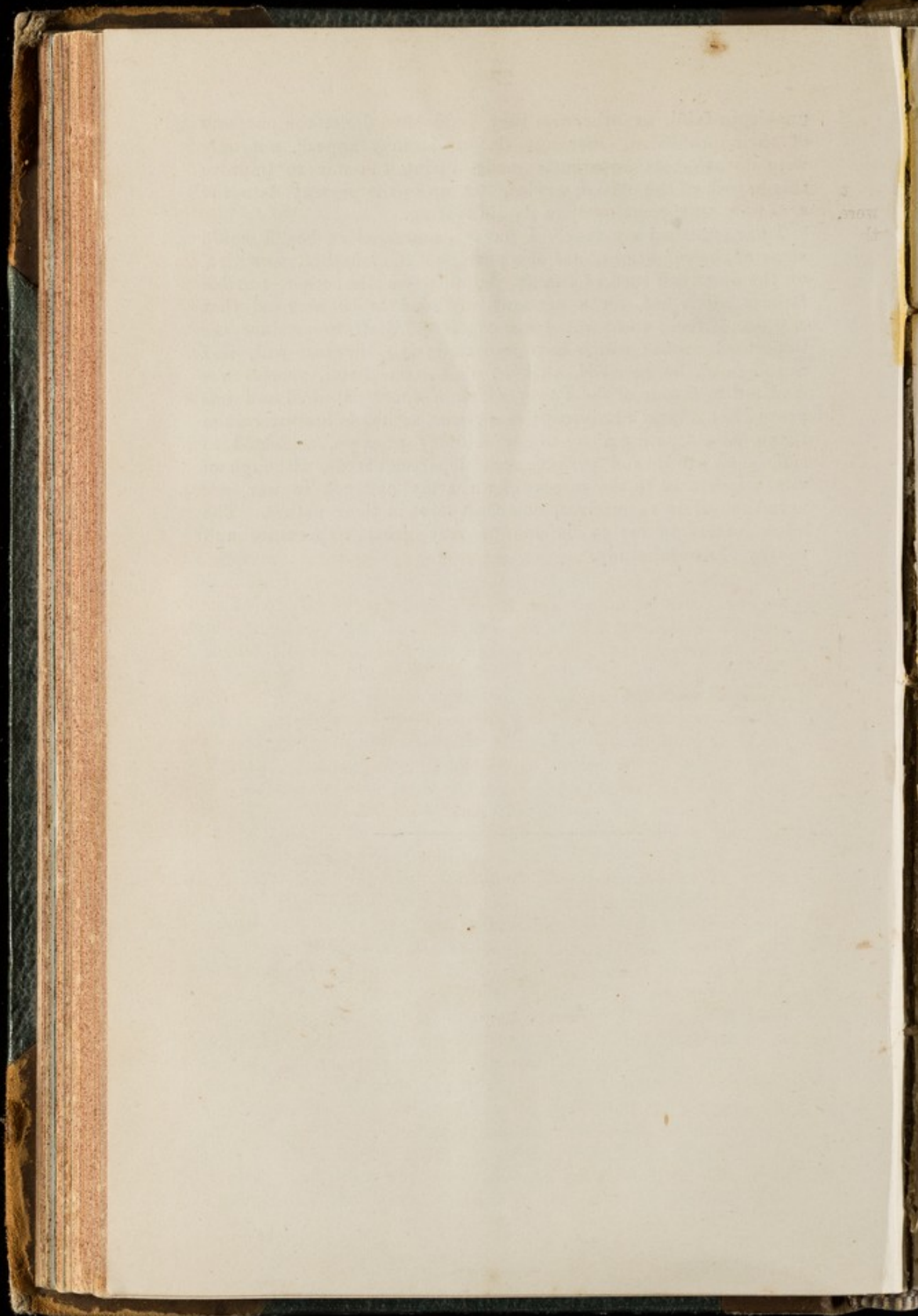


unable to fulfil, as otherwise they could have done, the purposes of their profession. Strange also as it may appear, not only were no attempts apparently made during the war to improve this branch of the official service, but up to the present date the *service de santé* remains upon its old footing.

I have finished my task. I have enumerated as best I could some of the conditions, not of a purely military nature, to which, on the one hand success was attributable—on the other, terrible failure. It is not, for a moment, intended to be asserted that any one of these enumerated was capable of itself to produce the important results which have occurred; but the fact will, if I mistake not, be received, that if, on the one hand, success has declared in favour of the Power which has most studied and improved her several administrative services, so has failure overtaken that which, trusting alone to her military prestige, neglected to sufficiently study and perfect such departments as, although of vital importance to the success of an army engaged in war, are nevertheless, in themselves, *non-combattant* in their nature. The lesson seems to me to be one of very great importance and worthy of careful study.

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No. 7.

# INTRODUCTORY ADDRESS

DELIVERED AT THE OPENING OF THE  
ARMY MEDICO-CHIRURGICAL SOCIETY  
OF PORTSMOUTH,  
WEDNESDAY, MARCH 11th, 1868,

BY  
C. A. GORDON, M.D. C.B.

DEPUTY INSPECTOR GENERAL OF HOSPITALS.

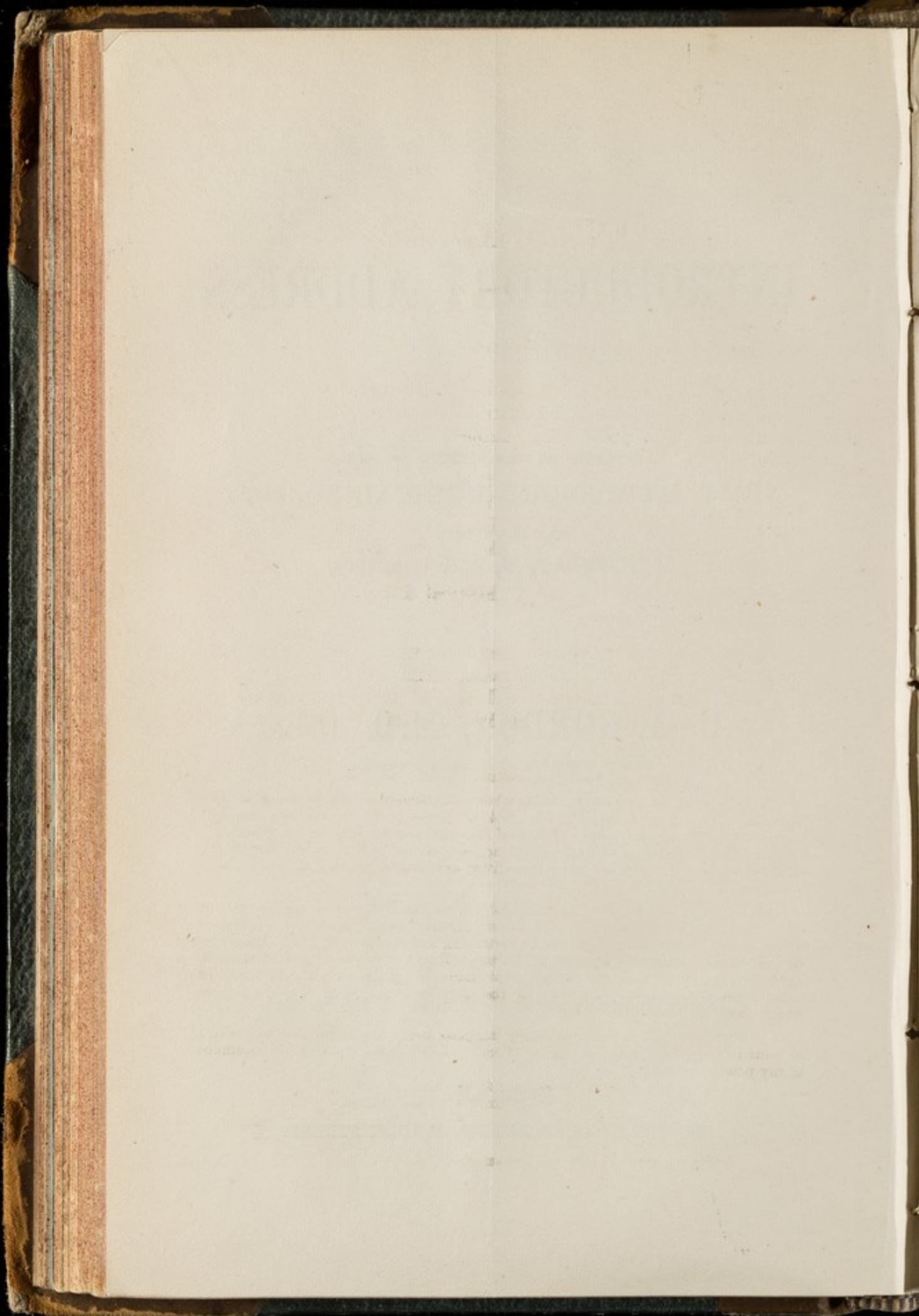
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(Printed by desire, and at the Expense of the Society).

Portsmouth :

PRINTED BY CHARPENTIER, 46, HIGH STREET.







## OPENING ADDRESS.

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SIR GEORGE BULLER AND GENTLEMEN,

My brother Medical Officers here stationed having heartily joined me in the desire to institute a Society among ourselves for the discussion of professional subjects and for obtaining ready access to the leading periodicals of the day, several preliminary meetings were held with a view to consider the practicability of this measure. It was decided at one of those meetings that our society should be called "The Army Medico-Chirurgical Society of Portsmouth;" that the General Officer commanding the district should be solicited to sanction its formation, and the Director-General of the Army Medical Department to grant it his patronage and support.

You, Sir, by your presence here among us, testify your kind approval of our scheme; and in what terms the Director-General has been pleased to respond, will be best stated by reading the communication with which he has favoured me on the subject. The letter is as follows—

Army Medical Department, March, 7th, 1868.

SIR,—I have the honour to acknowledge the receipt of the proceedings of a meeting of Army Medical Officers, held at Portsmouth on the 5th and 29th ultimo, to consider the practicability of instituting a Society for the discussion of professional subjects, and for obtaining ready access to the leading periodicals of the day, and to express my unqualified approval of the intention you have originated.

I am sure this project, which I should like to see followed in the camps and large garrisons where Medical Officers are numerous congregated, will reflect much credit on the Army Medical Department, and confer many advantages on its individual members stationed at Portsmouth, by cultivating and bringing to light, for the benefit of the Army, that mine of special wealth, not only in general professional subjects, but in the highest branches of sanitary science which the department possesses.

I shall have much pleasure in accepting your invitation to become the patron of your Society, and I shall be glad to afford it all the support and encouragement in my power.

I have the honour to be, Sir,  
Your most obedient Servant,

T. G. LOGAN, Director-General.

Dr. C. A. GORDON, C.B.,  
Principal Medical Officer, Portsmouth.



Thus, then, I may fairly say, our first endeavours have met with every encouragement ; and I trust that the very favourable auspices under which our labours begin may stimulate us in the future progress of our Society ; and that, by the opportunities which our meetings will afford us for communicating to each other the results of our individual experience on questions of medicine, surgery, and hygiene, as these bear upon the conditions of the soldier, and comparing our own views with those expressed in the current professional literature of the day, we may thus the more effectually be able to carry out the great object of maintaining the efficiency of the troops committed to our professional care.

It is not now necessary, considering the audience I have the honour to address, to dilate upon the great importance to an Army of an efficient Medical Department. This has been demonstrated by the events of the past few years, even to those who care not to refer to the history of more distant times, or of other nations than our own. I will therefore, with your kind permission refer rather to some of the steps by which the profession of the Army Medical Officer has risen to its present high and responsible position.

The limits within which I must confine my present remarks permit me only to glance at the position which the Army Surgeon of ancient Greece occupied in the estimation of his Commanders and fellows ; but you doubtless remember that when, during the expedition against Troy, supposed to have taken place about eleven hundred and ninety years before our era, Machaon, who attended upon the wounded, and during battle also fought in the ranks, was himself wounded by Paris, not only did Achilles inquire anxiously after " the offspring of the gods,"—as he was pleased to call this military surgeon, but we read that the whole army was interested in his recovery. "A leech," said they, " who like him knows how to cut out darts and relieve the smarting of wounds by soothing unguents, is to armies more in value than many other heroes,"—a sentiment which scarcely gains in force, if it does in euphony of expression, as clothed by Pope in the oft quoted lines—

" A wise Physician, skilled our wounds to heal,  
Is more than thousands to the common weal."

In Western Europe the rise of the profession was less rapid. It was not till the use of gunpowder had been regularly introduced into warfare, that Surgeons became an integral part of Military Establishments. Since then however, not only have they been directly concerned in bringing about the various improvements that have from time to time been effected in the



conditions of the soldier, but to their experience in the treatment of diseases and inquiries incidental to Military Service our brethren in Civil life are indebted for some of the more important advances that have been made in the healing art.

To Thomas Gale, a surgeon in the Army of Queen Elizabeth, the profession, whether in Civil or in Military life is indebted for the first work on Gunshot wounds published in this country. That work appeared in 1563, in which year he also gave a formula for preparing a styptic powder, in part supercession of the barbarous applications then in use for controlling hæmorrhage.

But it is to Paré that we must look as being the father of Military Surgery. About the middle of the sixteenth century\* he followed the French army, and was the first Surgeon who applied ligatures for the suppression of bleeding from an artery. There is, however, one incident in his career, to which I would solicit especial attention. We learn of him that when Metz was besieged by the Spanish Army under Charles V, the garrison suffered heavy loss, and the number of wounded was very great. The surgeons on that occasion are said to have been few and incompetent, and as asserted, probably slew more by their bad treatment than the Spaniards did by the sword. The Duke of Guise who commanded the Garrison wrote to the French king, imploring him to send Paré to his help; and when this surgeon had succeeded in passing through the enemy's lines, the Duke, the Generals, and the Captains gave him an affectionate welcome; while it is recorded that the soldiers, when they heard of his arrival, cried "We no longer fear dying of our wounds—our friend is among us." Nor was this all; his very presence among the troops, by the confidence it imparted gave them increased courage, so much that instead of capitulating as they had begun to fear was a probable contingency, they now persisted in their defence until their besiegers perished beneath the city walls.

Peter Lowe, after having towards the end of the same century served as an Army Medical Officer, retired and settled in Glasgow, where he established the Medical School which still exists under the name of the Faculty of Physicians and Surgeons. In 1596, he published his work on "The Whole Course of Chirurgie."

To John Woodall, an Army Surgeon, is due the credit of having introduced lime juice into the treatment of scurvy. It was he also who first advocated the propriety in certain cases, of amputating the foot at the ankle joint. The mention of scurvy

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\* The service of Paré dates from 1552. He was employed successively under Henry II, Francis II, Charles IX, and Henry III.



and its remedy in connection with the name of this surgeon, would rather indicate that he had belonged to the Navy than to the Army; and the truth is, he at different periods of his career belonged to each of these branches of the public service; thus, in 1589, he accompanied the forces sent under the command of Lord Willoughby to the aid of Henry IV; and in 1626, was charged with all Medical arrangements for the Royal Navy.

It is to the writings of Richard Wiseman another Army Surgeon, who between 1672 and 1676 published various works, that the profession is indebted for the introduction of primary instead of secondary amputation in cases of gunshot wounds; and to Mr. Middleton, Surgeon to the troops serving in the Low Countries in 1748 under the Duke of Cumberland, the Army is indebted for the first properly equipped Hospitals,—the patients on that occasion having had separate and clean beds, frequent changes of linen, hospital store-keepers, clerks, and trained female nurses—all acting as we read, *under the Surgeons*.

To Dr. Cleghorn also an Army Surgeon, who in 1751 published a work on the epidemic diseases of Minorca, the profession is indebted for the first account of cholera, as well as for having been the first to treat dysentery by means of Ipecacuan; and shortly after this date we find upon the rolls of the Army Medical Department the name of *John Hunter*, of whom it need only be said in this place, that a greater Surgeon, Anatomist, and Physiologist, has never lived before or since his day: and that to enumerate the improvements effected by him, would be to discuss the whole circle of Medical science.

In 1762, he thus described his own position with the Army then at Bellisle.—“I am called Surgeon-General, Deputy-Purveyor, Inspector and Director of Regimental Hospitals.” In 1794, he filled the position of Director-General.

And now great names come thick upon us. Donald Munro, an Army Surgeon, and cotemporary of Hunter, may be said to have placed the study of Anatomy in the University of Edinburgh upon a scientific basis; and it may be mentioned here that he was the first of four generations of his name who in succession filled the Chair which he in effect established.

Then comes the name of Brocklesby, of whom we learn that he set to work to improve the wretched Barracks and still more wretched Hospitals, into which in his days the troops were crowded. He drew up a code of instructions for the preservation of health, and especially enforced the observance of cleanliness and good ventilation. To him the profession is indebted for the



plan of treating cases of fever by means of liberal quantities of wine, in supercession of the bleedings and depletions that up to his time had been in use.

I would remind you that not until 1739 were Barracks erected in this country for the accommodation of soldiers. Prior to that date the men lived in billets—chiefly in beer houses and livery stables; being there lodged in “garrets, lumber-rooms, or back sheds fit for no other purpose;” absolutely without means of preserving personal cleanliness, and destitute of those conveniences which are no less essential to bodily health than they are to morality.

Such being the conditions, it will hardly seem credible to us of the present day that when in 1720 the first proposal to establish Barracks for the troops was made, it was violently opposed; the people of London declaring that they wanted “no red-coated nurses.” Perhaps therefore, it is not to be wondered at that the buildings erected, after nineteen years of discussion, and, as we are informed, “angry suspicion in the public mind,” were as described by Dr. Brocklesby, “low and ill ventilated,—calculated rather to generate than cure disease; and sweeping off the men like a perpetual pestilence.” To him, in conjunction with Munro, Pringle, and Hume, is due the credit of instituting Post Mortem Examinations, at a time prior to that when this method of investigating the action of disease was systematically adopted in Civil Hospitals.

Then came Dr. Girdlestone, who was the first to publish a work on Liver Disease and Cholera, as these affect British soldiers in India.

Dr. Hamilton, also an Army Surgeon, who was the first to advocate the abolition of Corporal Punishment, saying regarding it, “I wish it with all my heart abolished; it is an inhuman thing, more fitting the nature of savages than civilized and polished nations.” Such were the sentiments expressed by him in 1787.

In 1791, John Bell, of the 26th Regiment, introduced into Military Hospitals a scale of diets, suited to the requirements of sick men, instead of the salt pork and beef which prior to that time had been the food allowed to the soldier, whether at his ordinary duties or prostrated with dysentery. He published a work on the causes which produce, and means of preventing disease in the West Indies,—the title indicating the importance which he attached to Hygiène; and to him, in a letter addressed to Earl Spencer in 1798, is due the first advocacy of one great School for Military Surgery. In that communication he entered into various details in regard to the subjects which, according to



his views should be taught in such a School. These were Anatomy, Military Surgery, Military Medicine, Medical Geography including climates, seasons, the coasts of various countries; the manner of conducting soldiers in Foreign expeditions, the general care of their health, the choice of encampments, the forming of Hospitals on shore, how to convert churches and public buildings to this purpose, how to attend an Army in the field, how to lay wounded in besieged towns, and how to carry them off the field in a retreating army. He would moreover have taught what he called Military Economics,—as diet, clothing, exercise, general medicine, and all methods of preventing disease. Surely, it must be admitted that this Army Medical Officer justly appreciated the importance of preventive medicine, or Hygiène, as this branch of science is now more generally termed.

In 1791 appeared the first work published by Robert Jackson ; and in which he entered into the consideration of the different means then adopted for preserving the health of the soldier. He well described the duties of the Army Surgeon as being confessedly complex,—comprehending “ a wide range of general and practical knowledge of Military Science, as well as a correct acquaintance with the history, causes, and consequences of the diseases to which troops are most liable in the field or in quarters.” To his advocacy the soldier in the West Indies is indebted for the boon of being quartered in the more elevated positions ; and it may perhaps sound strange to you, yet such is the fact, that it was this Medical Officer who first advocated the instruction of our troops in ball firing. But it may perhaps be well to be a little more precise upon this point. Turn we therefore to page 260 of his great work on the Organization and Discipline of Armies, and we there find his suggestion “ that, during the period of Military Training, and after six months of previous education, three days in the week be set apart for the practice of firing ball cartridge.” He moreover descended to still further particulars, and suggested that seven rounds should be the number to be fired on each occasion. On the subject of Barrack construction in tropical regions he thus expressed himself with special reference to the West Indies, “ Barracks should be raised from the ground on brick pillars, to a height of three feet, and thoroughly ventilated beneath. They should consist of only one storey, and have a roof lofty and double ; a piazza, ten or twelve feet in breadth, furnished with jalousies (painted green), should extend along their front and rear. The Barrack Room should contain twelve men, and there should be a room for a Non-commissioned officer at the end of the rear balcony.” Here then, we find



enumerated the very principles which, after an interval of sixty years were reproduced; but without the name of the Military Surgeon who first propounded them being so much as mentioned. He considered the Prussian system of terror a degrading one; and advocated throughout his long career the cultivation of a kindly communion between the British officer and private soldier—deeming that the latter ought always to be treated as a rational being. Whether with the Medical or Military Officer, he adds, the heart must be warm with charity, the mind firm in knowledge; for no class of men are more dexterous in probing the rotten parts of the heart, or in remarking the weak mind of their superiors than the mass of common soldiers. Among many other considerations which had reference to the efficiency of the Army and well-being of the individual soldier that this eminent Surgeon and estimable man devoted some of his attention to, was that of demeanour of Officers towards their men. I need scarcely mention that long before, and at the time he wrote, a system of severity was pursued, which in the present more enlightened days would not be tolerated.

To this system Dr. Jackson referred in the words which I take the liberty to quote from the pages of his biographer.\* It was he who first advocated the appointment of Health Officers to Armies in the Field. "As the health of Troops," so he observed, "is a matter of the greatest importance to the success of war, Health Officers may be justly considered to be an important part of an army." And in many other respects the Service is indebted to him for improvements, for full details of which I must refer you to his work already quoted—a work which is equally valuable to the Military as to the Medical Officer.

In 1793, Dr. Reide, who had served successively in the 29th and 60th Regiments, introduced into the Line a system of Statistical Returns and Nomenclature of Disease, which was afterwards adopted by Mr. Adair, the Director-General.

In 1794, Dr. Rollo published his work on the Means of Preserving Health in the West Indies; regarding which it may now be interesting to note the fact, when so much is being written on the subject of removing Troops from infected localities, that in it he gives as among the causes of the frequent relapses to which men suffering from fever and dysentery were liable, the circumstance that means did not exist to transport them to healthy localities during convalescence.

In 1796, Dr. Sommerville produced a work which embraced the subjects included under Army Hygiène; discussing in it the

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\* Organization of Armies, &c.



means of providing clothing for the troops ; for preserving their health ; prevention of infectious diseases ; and for effecting improvement in the soldiers' rations.

Three years afterwards, namely in 1799, Mr. Lemprière, Surgeon of the 13th Foot published a work in which he gave a short account of that Regiment while stationed at Jamaica, as illustrating the advantages of superior discipline and interior economy in preserving the health of the men ; entering also upon the discussion of the same general subjects as had been touched upon by Dr. Rollo.

We now come to men of the present century : men whose names are honourably associated with the great events by which its earlier years were distinguished. Among them, we may still derive benefit from a perusal of the Instructions published in 1809 by Borland, Lemprière, Pringle and Blane, with a view to protect the troops from the effects of malaria ; and if during that year an Army was lost at Walcheren, the reader of History knows full well that the occurrence arose from circumstances beyond the control of the Medical Officers.

I would next mention the name of Dr. Wright, another of those who wrote on this ill-fated expedition. In 1811, he advocated the measure of sending men who had suffered on that occasion from fever to Malta, or to some of our colonies the climate of which was moderate. And in the same year appeared the Treatise on Yellow Fever by Dr. Bancroft, which is still referred to as a standard work on that disease.

The names of Guthrie and of Hennen are still to the Army Surgeon familiar as household words. Both published the results of their great Surgical experience during the Peninsular War, and on the arrangements required for transporting and accommodating sick in times of active service.

Then follow in quick succession Dr. Thompson, who, subsequent to the battle of Waterloo at which he served became Professor of Military Surgery in the University of Edinburgh ; Sir George Bellinghall his immediate successor, to whose memory I would allude with the reverence and respect due from a pupil to his teacher ; then Henry Marshall, whose works on the Topography of Ceylon, on Recruiting, and on Invaliding, are still unsurpassed in regard to their respective subjects ; and then Dr. Millingen, the author of a Manual for the use of Army Medical Officers, and a strenuous advocate for the establishment of an Army Medical School as proposed by Bell.

Dr. Burke the first Principal Medical Officer of the Army who was sent to India, to whose oft repeated representations are due the first improvements in the Hygiènic conditions of the



soldier in that country that were sanctioned, whether referring to accommodation, food, clothing, recreation, moral advancement, measures for the repression of vice and crime, or the numerous other matters that have reference to his physical as well as moral well-being; and Dr. McLeod, his immediate successor, who most ably and in some respects successfully continued the good work that Dr. Burke had begun. It may well be said that to the labours of these two Medical Officers the soldier is indebted for enjoying whatever advantages service in India now offers to him.

Permit me briefly to glance at a few, and only a few of the conditions which these two eminent men, and the Medical Officers serving under them set to work to improve.

So recently as 1826, the Troops quartered in Fort William were so much crowded that alarming illness occurred among them. The Hospitals became filled, and there remained scarcely sufficient men to conduct the duties of the garrison. Dr. Burke represented the real cause; a number of the troops were removed; he laid down rules by which not less than 900 cubic feet should be allowed per man; and had the satisfaction to find the measures inaugurated by him followed by immediate decrease in the prevailing sickness.

At this time our soldiers in India were unprovided with bedsteads; and it was customary to send newly arrived Troops into any kind of buildings that were available. Thus, when, in 1827, the *Buff's* landed from New South Wales, the Regiment was put into a range of Cavalry stables at Bhangulpore on the bank of the Ganges. No wonder that ophthalmia first, and then cholera almost immediately occurred among the men. Dr. Burke urged his protests against the accommodation; bedsteads were after a time granted to the men, and in 1828 the station was abandoned.

At this time the soldier quartered in what were then considered the upper stations of India received a considerably larger quantity of animal food daily than did those in the lower provinces; and in addition, as much as one-twentieth part of a gallon of ardent spirits daily. By the representations of Dr. Burke the scale of rations was placed upon an improved footing, and the system of issuing spirits to the men suppressed.

Although thus early soldiers in India were permitted during the hot season to wear a light cotton dress, the order on the subject was in some Regiments evaded even at the cost of some lives. The Inspector-general with reference to this circumstance urged upon the then Commander-in-Chief the necessity that during the hot season the soldiers should be exempted from wearing cloth jackets or coats. Similar representations were made from time to time by his successors; and to these repre-



sentations the soldier in India is now indebted for the boon of having clothing suited to the conditions of the climate.

I need not here dilate on the advantages as regards health of quartering Troops at hill stations in India, instead of retaining them continuously in the plains. The question has of late attracted a great deal of attention, and the fact has been lost sight of that so long ago as 1828 the first sanatorium of the kind was established at Landour, and that Dr. Burke already dwelt upon the necessity of making careful selection of the men to be sent there.

In the establishment of Temperance Societies as a means of lessening the vice of drunkenness among the soldiers, he took a prominent part; expressing himself in words that deserve to be quoted—"There is no such slavery in existence," so he wrote, "as he whose reason is under the embruted dominion of the wild and furious passions produced by intoxication; inducing a brutality capable of crimes at which the simple barbarians of nature would be astonished." To wean the soldier therefore from such a state was Dr. Burke's great aim in advocating the formation of these institutions, and for which he earnestly solicited the co-operation of Commanding Officers of Regiments. Of the results which in due course followed the introduction of such Societies, I can only notice those in the 26th Cameronians, of which Regiment Colonel Oglander was at the time alluded to Commanding Officer, and Dr. Bell Surgeon; both giving their minds heartily to the progress of the good work. Within two years after their introduction the annual remittances of the men to their friends had amounted to £1416; and no case of corporal punishment had occurred in the Regiment.

Dr. Burke might well feel satisfied with the success of his measure, as doubtless he did when, in his official reports, he thus expressed himself—"It is too much the fashion," said he, "to consider soldiers as mere machines, and devoid of those qualities that enable them to conduct themselves like reasonable beings, and to treat them accordingly. To all such opinions," he adds, "the above is an answer."

I can only refer in the most cursory manner to the history of Cholera in India as handed down to us by the two Medical Officers already named. They had early observed the facts that this most terrible scourge usually travels with the course of the rainy season and along the banks of the Ganges from East to West; that violent storms of wind usually arrest or modify its intensity; that intermittent and other fevers usually prevail during seasons in which it is severe; that its presence modifies the symptoms of other diseases; that its occurrence is often



attended by epizootics of various kinds among animals, even those that are cold blooded; and that troops occupying ground floors were more liable to be attacked by it than those who are more elevated. Many suggestions were also offered as to the measures of prevention, as well as those that ought to be adopted on the occurrence of the disease; regarding which I can only now remark that in completeness and practical value they still are unexcelled.

Considering what has of late years been said and written regarding the plan of moving troops into camp to avoid or escape from epidemics of this disease, you may not be prepared to learn that Dr. Burke, in summarising the report of the 31st Foot for 1825, writes \* "that, previous to the 20th of December, the Regiment had suffered much from Cholera while stationed in Fort William; but on being encamped on the open plain or esplanade the disease seemed immediately to abate, and ceased soon after."

In his report for 1829, he recorded similar favourable results from the same measure adopted at Berhampore; but adds, that removal of the men to be successful must be done at proper seasons; that, "in hot winds, encamping the men was found to be attended with no advantage, but the contrary." He was well aware of the advantages of this measure; but equally so of its evils when injudiciously adopted.

I much regret that in this brief sketch I have had to hurry over my subject; but time presses, and I must now restrict myself to some of the more important services rendered by the two other Medical Officers to whom on this occasion I may allude, namely to Larrey and McGregor; men who, although serving with opposing forces, had in their characters much that was common to both.

To the former, Europe and the civilized world are indebted for an organized system of transport for wounded; and you have doubtless read that when on one occasion the sick under his care were perishing for want of necessary sustenance, he on his own responsibility ordered the slaughter of the Officers' chargers † to furnish soup for his patients; how Napoleon under whom he served applauded the act; and when their official connection had ceased, described this Army Surgeon as having been the most upright public servant he had ever met.

Of the numerous and important services of the late Sir James McGregor I can only hope to give a very faint sketch. Towards

\* His Report for 1826, page 111.

† The occurrence in question took place in April, 1808, on the Island of Lobau, in the Danube, to which the French sick and wounded were sent after the fall of Vienna, and Battle of Eslingen.



the end of last century he distinguished himself by the efficiency of the measures he adopted to protect the men of his Regiment, the Connaught Rangers, from yellow fever, during the expedition to Granada. His name is next prominently mentioned in connection with his successful administration while in charge of the Force sent from India to Egypt under Sir David Baird; then with the excellent report of that expedition which he published; and, for more than forty years afterwards, there was not an improvement in the condition of the soldier but had connected with it the name of this distinguished Army Medical Officer.

To his early exertions the soldier is indebted for the luxury of a separate bed; for, as you are doubtless aware, the men had up till his time been packed away in tiers of "bunks" arranged along the sides of the barrack-room; three, four, and, in some cases five men being arranged alongside one another in each bunk. To his representations and example is also due the abolition of a system according to which soldiers were wont to be discharged from Hospital before convalescence had advanced sufficiently to render them perfectly fit for duty; and to him is due the credit of having instituted wards for convalescents, separate from the ordinary ones in which patients actually suffering from disease were treated.

In 1808 and 1809, Sir James held the position in this garrison and district which I have the honour now to occupy; and here, in the early part of the latter year, his powers of administration and arrangement were displayed in providing for the remnants of the Army that arrived in crowded transports from Corunna. Among the evils which attended the retreat to that place was Typhus fever. This disease having once attacked the Force rapidly spread; and when the shattered remains of the troops landed at Portsmouth the number of persons sick was overwhelming. Sir James McGregor was called upon to extemporize accommodation, medical attendants, nurses, and purveying staff for them. The Naval authorities of that day readily placed at his disposal the greater portion of their magnificent Hospital at Haslar; the Military Hospitals in Garrison were speedily filled; and every available private establishment was taken advantage of.

The dangers to be apprehended from extension of this terrible disease to the healthy troops and civil population were early recognized by him, and every possible precaution adopted against such contingency. These precautions however were ineffectual; for, as we read, the virulence of the disease was such that it soon began to spread, and before long had extended itself to the Military at Horsham and to the civil population of Sussex.



We can only faintly realize the administrative capacity necessary to meet conditions such as these, and the ready resource that was required to combat each succeeding emergency as it arose ; and yet Dr. Mc.Gregor was about to be called upon to take his part in more stirring, and it may be, more important events than any that have as yet been mentioned.

In January, 1812, he arrived at Lisbon and assumed charge of the Duke of Wellington's army ; nor was it long before that great Commander discovered the high qualities of his Principal Medical Officer to whom he gave his entire confidence ; communicating with him daily and acquainting him of his intended operations.

The results of this confidence and the mutual co-operation which it engendered are so important, and at the same time so suggestive that I would crave attention to some of them.

He began by dispersing the great numbers of soldiers and officers, who on the plea of being under treatment at the General Hospital at Lisbon, are said to have preferred the life in that luxurious city to their duties with the army. He instituted Field and Regimental Hospitals in partial supercession of that description of which that just mentioned was an example. One of his many qualifications for the position which he held was the readiness with which he made arrangements to meet events that were about to occur, thus, when Lord Wellington announced to him his intended movement in Badajos, Sir James Mc.Gregor made arrangements whereby every Regiment and Division was at once supplied with every kind of stores, medicine, instruments, and appliances that were likely to be necessary, and in addition to these measures established a depôt at Elvas for such further supply as might be required. Another great quality of this Army Medical Officer was the accuracy of the estimates he was wont to form of the numbers of men, who, from time to time, might be expected to return to the ranks after treatment in hospital on account of wounds or disease ; and we have numerous proofs that in his manner of conducting duties with the Medical Officers under him, he secured their personal good feeling and hearty co-operation. And what were the results that arose from the confidence with which he was treated by his Commanding Officer, and the heartiness with which good feeling towards him personally induced the other Surgeons throughout that Army to second his exertions ?

We have them worded at page 331 of his Autobiography, and I will give you the words verbatim. "It was said with much truth by an eminent individual that he thought the extraordinary exertions of the Medical Officers of the Army might be said to



have decided the day at Vittoria, for their exertions had undoubtedly added a full division to the strength of Lord Wellington's Army, and without those 4000 or 5000 men it is more than doubtful if his lordship with all his unrivalled talents could have carried the day." The eminent individual here alluded to is Napier, the Historian of the Peninsular War.

Such then are some of the men, such their services, and such the nature of the steps by which the Officers of the Army Medical Department have attained their present position; the services being rendered in all the varying circumstances of military life, in war and in peace, in times of pestilence, and in all climates; and as will doubtless have been observed, the men by whom they were performed, all high-minded and zealous officers devoted to their profession and to the service of which they were members.

We too would desire to follow the noble example they have given us. We would endeavour as far as in us lies to preserve in tact, and add to that purely professional knowledge without which it is impossible to make headway either in military or in civil life. We would by continued attention to the rules, orders, and usages of the army, by careful study of the influences that affect masses, by the cultivation of good understanding among ourselves, and of confidential intercourse with our military brethren endeavour to fulfil the great object for which we alike strive, namely the efficiency of that portion of the British Army with which we are more immediately associated.

And now in conclusion I have to tender our thanks to you Sir, and to our other distinguished visitors for the honour you have done us in coming here this day.

Before resuming my seat, I beg to announce that at our next meeting to be held in this hospital on Wednesday the 1st of April, Staff-Surgeon Cullen will read a paper on some cases of fever with characters of purpura maligna that have recently occurred in the 11th Depot Battalion at Gosport; and on the part of the Members of this Society as well as my own, to express the pleasure we shall feel to be favoured with the company of any member of the profession, whether in the Naval Service or in civil life, who may find it convenient to join us on that occasion.



*M. D.*

LA  
CAMPAGNE D'ITALIE EN 1859

AU POINT DE VUE  
MÉDICO-CHIRURGICAL ET ADMINISTRATIF

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*Statistique médico-chirurgicale de la campagne d'Italie*  
par le docteur J. C. CHENU

*Revue par Léon Le Fort.*

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PARIS  
VICTOR MASSON ET FILS

PLACE DE L'ÉCOLE-DE-MÉDECINE

1869





Extrait de la Gazette hebdomadaire de médecine et de chirurgie.





LA

## CAMPAGNE D'ITALIE EN 1859

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Il y a quatre ans, M. Chenu, dans un magnifique ouvrage, publiait, sous les auspices du ministère de la guerre, l'histoire médico-chirurgicale de la campagne d'Orient; aujourd'hui, dans un ouvrage plus magnifique encore, il nous trace l'histoire de la campagne d'Italie. Mais, cette fois, la publication ne paraît pas s'être faite sous les auspices de l'administration, et l'on dit même que notre collègue a dû attendre, pour faire paraître son livre, que l'âge de la retraite lui eût rendu, non son indépendance d'esprit, mais sa liberté d'action. C'est que, dans notre beau pays de France, le militaire ne doit connaître qu'une vertu : l'obéissance passive, qu'une chose digne de respect : la hiérarchie; aussi n'a-t-il pas le droit de publier une ligne sans l'approbation de messieurs ses supérieurs. Or, comme le supérieur d'un médecin n'est pas un autre médecin, mais un administrateur, et comme M. Chenu nous montre une fois de plus que l'administration, c'est-à-dire l'intendance, a la responsabilité morale d'effroyables désastres, il n'est pas difficile de deviner que celle-ci se soit empressée d'autoriser formellement M. Chenu... à se taire.

Heureusement notre confrère a pu cesser d'être muet par ordre; son livre a paru il y a quelques semaines, et nous pouvons maintenant analyser et étudier les faits si nombreux et si intéressants qu'il porte aujourd'hui à la connaissance de tous.

Parmi les questions chirurgicales, celle qui, dans un pareil sujet, prime toutes les autres, est l'étude des résultats obtenus dans le traitement des plaies par armes à feu, et tout d'abord



celle de la mortalité après les amputations. Mais pour ceux qui prennent en suspicion les déductions les mieux fondées dès qu'elles se basent sur des chiffres et que la vue seule d'une statistique irrite, disons tout de suite comment sont établies celles de M. Chenu.

Un soldat amputé par suite d'une blessure reçue dans un service commandé a droit à une pension ; cette pension ne s'obtient qu'après un sérieux examen, appuyé de pièces fort nombreuses (on sait qu'en France on ne ménage pas les écritures) ; par conséquent, pour les amputés guéris, les résultats sont connus exactement, etc. Tout soldat amputé figure sur les relevés de l'hôpital, de l'ambulance où il a été recueilli. S'il meurt des suites de l'opération, le décès est constaté, l'acte est transmis au régiment auquel il appartient, au ministère, à sa famille, etc. ; donc aucune erreur n'est possible si, comme l'a fait M. Chenu, on dresse un état nominatif de tous les amputés et si on les suit d'hôpital en hôpital, dans les cas trop nombreux où l'on a cru devoir leur faire faire ces promenades meurtrières qu'on appelle des évacuations. Les chiffres contenus dans ce tableau, dressé avec les documents consignés en détail dans le livre de M. Chenu, ont donc au premier chef les caractères de l'exactitude. Malheureusement ils n'ont rien dont nous ayons sujet de nous réjouir comme hommes, et encore moins de nous enorgueillir comme chirurgiens français.

La mortalité après les amputations a été excessive. Plus de la moitié des amputés du bras, à peu près la moitié des amputés de l'avant-bras, plus des trois quarts des amputés de la cuisse, les deux tiers des amputés de la jambe, sont morts. En revanche, la proportion des blessés guéris après la désarticulation de la hanche est considérable, 3 sur 7 ; mais un seul d'entre eux a été opéré en Italie ; les deux autres malades ont subi l'opération assez longtemps après et dans les hôpitaux de la marine, à Toulon. Ces derniers faits sont connus déjà depuis longtemps par la publication du mémoire de M. Jules Roux (de Toulon).

La conservation du membre a-t-elle donné de meilleurs résultats que l'amputation ? telle est la question qu'on est amené tout de suite à se poser ; malheureusement les renseignements contenus dans le livre de M. Chenu, quelque nombreux qu'ils soient, ne peuvent permettre d'aborder avec fruit cette étude.

A côté du chiffre des pensionnés et de celui des morts, s'en place un troisième, celui des malades sortis guéris ou évacués ; or ce dernier chiffre est si considérable, comme nombre,



|                                   | NOMBRE<br>des<br>OPÉRATIONS. | PRIMITIVES. |        | SECONDAIRES. |        | INDÉTERMINÉES. |        | TOTAL.  |        | MORTALITÉ<br>pour<br>400. |
|-----------------------------------|------------------------------|-------------|--------|--------------|--------|----------------|--------|---------|--------|---------------------------|
|                                   |                              | Guéris.     | Morts. | Guéris.      | Morts. | Guéris.        | Morts. | Guéris. | Morts. |                           |
| Désarticulation de l'épaule.....  | 75 (1)                       | 6           | 5      | 18           | 16     | 11             | 48     | 35      | 39     | 52,7                      |
| Amputation du bras (2).....       | 314 (1)                      | »           | »      | »            | »      | »              | »      | 438     | 475    | 55,8                      |
| Désarticulation du coude (2)..... | 6                            | »           | »      | »            | »      | »              | »      | 1       | 5      | 83,3                      |
| Amputation de l'avant-bras (2)... | 61                           | »           | »      | »            | »      | »              | »      | 52      | 39     | 42,8                      |
| Désarticulation de la hanche (2). | 7                            | »           | »      | 3(3)         | »      | »              | 4      | 3       | 4      | 57,1                      |
| Amputation de la cuisse.....      | 336                          | 8           | 58     | 16           | 73     | 55             | 126    | 79      | 257    | 76,4                      |
| Désarticulation du genou (2)..... | 4                            | »           | »      | »            | »      | »              | »      | 1       | 3      | 75,0                      |
| Amputation de la jambe.....       | 347                          | 5           | 13     | 13           | 58     | 86             | 160    | 116     | 231    | 66,5                      |
|                                   | 1180                         |             |        |              |        |                |        | 425     | 753    | 63,9                      |

(1) L'écart entre ce chiffre et celui du total des guérisons et des morts est dû à ce que pour deux malades évacués le résultat final est incertain.

(2) Le caractère de l'amputation n'a été établi que pour quelques malades.

(3) Deux des trois malades guéris ont été opérés à Toulon dans les hôpitaux de la marine.



à côté des deux autres, qu'il empêche toute appréciation rigoureuse, c'est-à-dire vraiment scientifique. Un soldat amputé et guéri est réformé et pensionné; on connaît donc tous les guéris en prenant la liste des pensions; on connaît également tous les morts; mais un blessé guéri sans amputation ne recevant pas de pension peut rentrer dans son régiment sans laisser d'autre trace de son passage à l'hôpital que la présence de son nom sur les états des hôpitaux où il a été admis. Si l'on n'avait pas imaginé les évacuations, la recherche serait facile et les rapports partiels de chaque hôpital seraient suffisamment probants; mais il n'en est pas ainsi. Un blessé est transporté du champ de bataille dans un hôpital; il y meurt; tout est dit, et il compte comme un au chiffre des blessés. Au contraire, il résiste; il entre, je suppose, à l'hôpital de Brescia, puis il est, quelques jours après, évacué sur Milan; il figure pour un, à la colonne des guéris ou évacués, sur la liste de Brescia, comme cas de conservation. De Milan il passe à Alexandrie, d'Alexandrie à Gênes, de Gênes à Marseille; il a pu ainsi compter quatre fois sur quatre listes comme guéri ou évacué; de telle sorte que le nombre des succès par la conservation pourrait être multiplié involontairement, plus qu'il ne le comporte la vérité.

La seconde question à examiner serait celle de la gravité relative des amputations primitives et secondaires. Là encore nous devons nous abstenir, et pour deux raisons. La première, c'est que cette distinction n'est établie que pour un petit nombre de cas, fort dépassé par le chiffre de ceux où cette distinction n'a pu être faite. La seconde, c'est que le mot amputation primitive n'a, dans la chirurgie militaire, ni l'acception réelle qui lui appartient, ni une signification toujours la même. L'amputation primitive, c'est-à-dire celle qui est faite quelques heures après la blessure, semble offrir des chances de succès; l'amputation faite après l'apparition de la fièvre traumatique est des plus graves. Or, dans la chirurgie militaire, comme on n'a relevé les blessés qu'après vingt-quatre, trente-six, quarante-huit heures, quelquefois plus, on ne les ampute trop souvent qu'après trois ou quatre jours, et cette amputation, qu'on qualifie alors de primitive, parce qu'elle a été faite lors de la première visite du chirurgien, n'est en réalité qu'une opération intermédiaire, retardée, pendant la fièvre (peu importe le nom qu'on choisisse), c'est-à-dire une amputation faite au moment où elle a le plus de gravité. Il n'est donc pas étonnant que les amputations appelées à tort primitives figurent dans ce tableau pour une mortalité plus



grande que les amputations secondaires, puisque ces soi-disant amputations primitives ont été faites pendant la fièvre traumatique.

Il est une autre question fort importante qu'il nous faut maintenant examiner, c'est celle de la comparaison des résultats obtenus en Italie, après les amputations, avec ceux qui ont suivi les mêmes opérations faites en Crimée dans les armées anglaise et française, et, en Amérique, dans l'armée fédérale. A mon point de vue, cette question est peut-être la plus importante ; car, de même qu'en montrant, il y a dix ans passés, que nous perdions plus d'amputés dans nos hôpitaux de Paris que dans ceux de Londres, j'ai été amené à rechercher les causes de cette différence et à réveiller la question de l'hygiène hospitalière, aujourd'hui étudiée partout ; de même, en appliquant cette comparaison aux amputés militaires, on est amené à rechercher, comme on le fait depuis plusieurs années, quelles sont les modifications que l'on doit apporter à l'organisation des ambulances et des hôpitaux militaires pour améliorer une situation dont nous allons une fois de plus, avec l'aide tout-puissant des faits révélés par la statistique et par les recherches de M. Chenu, montrer la déplorable gravité.

Dans un travail, publié l'année dernière dans la GAZETTE HEBDOMADAIRE (1868, p. 449), j'avais le regret de montrer par les chiffres l'effrayante infériorité des résultats obtenus par nos chirurgiens militaires pendant la campagne de Crimée ; j'en cherchai les causes, et parmi les principales, j'en signalai deux qui primaient toutes les autres : l'insuffisance du matériel et du personnel médical ; l'abus des évacuations, corrolaire obligé de la précédente, et enfin une cause capitale : la suprématie, que dis-je, l'omnipotence de l'intendance militaire. Cette omnipotence réduit à néant les efforts de nos confrères de l'armée, et place nos chirurgiens militaires dans un état d'incapacité légale, pour laisser toute l'autorité à un corps administratif qui, au point de vue de la médecine, est au contraire dans un état d'incapacité réelle, quels que puissent être, quels que soient le zèle, le dévouement indéniables des officiers de l'intendance. J'attaque l'institution, parce qu'elle entraîne fatalement des désastres qui la rendent plus meurtrière que le feu de l'ennemi ; je respecte, dans la personne des intendants, des hommes qui, sincèrement, complètement dévoués au salut du soldat, usent leur énergie, leur santé, leur vie, sans pouvoir contre-balancer les funestes effets d'une insuffisance collective, résultat fatal de l'organisation du corps auquel ils appartiennent.



Nous avons été plus que malheureux en Crimée; mais on était loin de la France, en pays ennemi, sans ressources à tirer de la contrée, par un hiver rigoureux; quels ont été nos résultats en Italie? Hélas! ils ne furent guère plus satisfaisants, qu'on en juge!

|                              | ARMÉE AMÉRICAINE.       | ARMÉE ANGLAISE.   | ARMÉE FRANÇAISE.  |                  |
|------------------------------|-------------------------|-------------------|-------------------|------------------|
|                              | Guerre de la sécession. | Guerre de Crimée. | Guerre de Crimée. | Guerre d'Italie. |
| Désarticulation de l'épaule. | 39,2                    | 33,3              | 61,7              | 52,7             |
| Amputation du bras.....      | 24,2                    | 24,5              | 55,5              | 55,8             |
| Amputation de l'avant-bras.  | 16,5                    | 5,0               | 45,2              | 42,8             |
| Désarticulation de la hanche | 85,7                    | 100,0             | 100,0             | 57,1             |
| Amputation de la cuisse...   | 64,4                    | 64,0              | 91,8              | 76,4             |
| Désarticulation du genou...  | 55,4                    | 57,1              | 91,3              | 75,0             |
| Amputation de la jambe...    | 26,0                    | 35,6              | 71,9              | 66,5             |
|                              | 40,2                    | 33,9              | 72,8              | 63,9             |

Ainsi, dans un pays ami, au milieu des ressources de toute espèce, l'été et sous un des plus beaux ciels de l'Europe, à six heures de nos frontières, pendant une campagne où nous fûmes toujours victorieux et qui ne dura que deux mois, entourés de villes et de villages où nous pouvions laisser nos blessés, la mortalité générale après les amputations fut encore de 63,9, près de 64 pour 100; 9 pour 100 seulement de moins qu'en Crimée, où tout était conjuré contre nous, climat, privations, fatigues d'une longue campagne, choléra, typhus, pourriture d'hôpital, etc. Nous perdions 63 pour 100 de nos opérés en Italie, quand les Anglais, sur ce champ de mort de la Crimée, ne perdirent que 33 pour 100; quand les Américains, dans leur lutte gigantesque à travers un territoire dévasté par la guerre, au milieu de toutes les difficultés, n'en perdirent que 40 pour 100, et cette différence désastreuse, nous la retrouvons pour chaque amputation en particulier.

C'est qu'en Italie, nous retrouvons les mêmes causes de mort que nous avons déjà trouvées en Crimée: insuffisance de personnel, insuffisance de matériel, impuissance des médecins devant l'omnipotence administrative, et enfin le fléau des évacuations.



Je ne dirai qu'un mot sur ce dernier point; car j'ai montré en détail, l'année dernière, dans ce journal même, quel est le rôle des évacuations dans le chiffre élevé de nos pertes. Ces évacuations peuvent être une nécessité dans une campagne d'hiver, dans un pays peu habité, sans végétation, sans forêts où l'on puisse trouver du bois pour construire des baraques, sans ressources en vivres, en logements, mais dans lequel des chemins de fer, un fleuve ou de grands cours d'eau permettent, comme en Amérique, le transport facile dans des *vagons* ou dans des *navires-hôpitaux*. En dehors de ces circonstances, recourir aux évacuations pour les amputés, pour les soldats atteints de fractures, c'est, aujourd'hui que l'expérience a prononcé, se rendre coupable d'homicide par imprudence. On craint que l'agglomération des blessés ne produise le typhus; le typhus ne naît que quand on veut bien le laisser naître. Est-ce que les Anglais, en Crimée, est-ce que les fédéraux ont eu le typhus comme nous l'avons eu en Crimée? Les médecins anglais et américains ont pu disséminer leurs malades dans des hôpitaux-baraques, et nous aurions pu le faire en Crimée si l'intendance eût écouté les conseils, les réclamations, les plaintes désolées de Michel Lévy, de Scrive, de Baudens.

En Italie, les évacuations, telles qu'elles furent faites, sont injustifiables. J'ai reçu plusieurs fois, pendant le mois de juillet, à Gênes, de malheureux blessés de Solferino atteints de fractures par coup de feu. Combien sont morts qui eussent été sauvés si le transport n'avait pas amené des accidents qu'on eût évités en les traitant sur place!

On craignait, dit-on, le typhus! mais était-il donc si difficile d'éviter l'encombrement, et fallait-il pour cela recourir à ces évacuations meurtrières dont on avait vu les résultats en Crimée? Comment! on est en pays ami, sous le beau ciel de l'Italie, dans la plus belle saison de l'année, par une température si élevée que nous avons plusieurs fois 37 et 38 degrés de chaleur; on est dans ces magnifiques plaines de la Lombardie, entouré de ressources de toute espèce, et l'on ne trouve pas moyen d'établir des hôpitaux sous tente! on est au milieu de villages riches, de villes pleines de ressources, et Solferino, Cavriana, Volta, Desenzano, Castiglione, Medole, Rivoltella, sont évacués le plus tôt possible, quand on pouvait y guérir nos blessés les plus graves; quand on pouvait disséminer les hommes blessés légèrement dans les villages plus éloignés et sur les bords enchanteurs et salubres du lac de Garde!



Qui décidait de ces graves mesures exclusivement du domaine légitime du médecin ?

27 mai. *Le major général à l'intendant général.* — Les derniers blessés de Voghera, transportables jusqu'ici par le chemin de fer, seront tous évacués d'urgence, si grave que soit leur situation... — VAILLANT.

Et le même jour, nous trouvons cette lettre :

*Grand quartier général. Alexandrie, 27 mai.* — M. l'intendant général,

Les évacuations de malades ou de blessés ont été faites jusqu'à ce jour avec tant de précipitation qu'elles ont besoin d'être régularisées pour le service médical des hôpitaux... — BARON LARREY.

Ah ! il faut que l'intendance soit bien puissante, puisque rien n'a pu être obtenu, alors que le médecin en chef de l'armée était en même temps chirurgien ordinaire de l'empereur, était investi de la confiance du Souverain et pouvait à toute heure lui communiquer directement les impressions et les regrets dont nous trouvons la preuve dans sa correspondance officielle avec l'intendance. Il faut que l'intendance ait été bien puissante pour que les réclamations incessantes, énergiques que M. Larrey ne peut manquer d'avoir faites, n'aient pas été plus efficaces.

L'insuffisance de matériel, le manque de vivres, de fourrages, d'objets de pansement, éclatent dès le début de la campagne, avant même qu'aient eu lieu les batailles de Magenta et de Solferino. Cependant l'empereur écrivait le 16 mai à l'intendant général Paris cette lettre remarquable :

« Depuis quarante-cinq ans, nous n'avons plus eu de guerre ; et dans toutes les petites guerres qui se sont faites, l'intelligence des intendants n'a pas pu être mise à l'épreuve, car tout consistait, pour l'intendance, à avoir de l'argent et à faire des marchés avec les fournisseurs.

» Tout cela peut être bon pour une guerre partielle et maritime, tout cela peut être utile dans une guerre continentale comme réserve ; mais, pour les grandes guerres en Europe, il n'y a qu'un seul principe efficace à appliquer en général, c'est de faire vivre l'armée avec les ressources du pays où elle se trouve, et, pour cela, il n'y a qu'un seul moyen, la réquisition payée comptant quand on est en pays ami, prises sans payer quand on est en pays ennemi. Ce système, le seul efficace, demande beaucoup d'intelligence et d'activité. Il est bien plus facile naturellement d'écrire au ministre de la guerre : Envoyez-moi tant de millions de rations...

» On dira peut-être, et c'est là le prétexte de tous ceux qui



ne veulent pas se donner la peine de chercher, que le pays ne peut pas fournir les ressources nécessaires...; c'est là une erreur capitale...; il est reconnu qu'un pays pourrait toujours nourrir pendant deux ou trois mois le double de sa population. Ainsi le Piémont, qui a près de cinq millions d'habitants, pourrait nourrir pendant deux ou trois mois une armée de cinq millions d'hommes... Ordonnez que, dans chaque commune, on cuise tant de rations de pain, qu'on enverra également au chef-lieu ou à des points désignés d'avance. Prenez enfin des mesures analogues...; etc.

» Signé : NAPOLEON. »

Les mesures sans doute furent mal prises, ou les intentions du souverain mal comprises, car « on fit venir de France à » Gènes des farines, du riz (comme si le Piémont et la Lom- » bardie n'en produisaient pas assez pour toute l'Europe), du » café, du sucre, et l'on a encombré cette place d'approvi- » sionnements de toute sorte, à tel point que cette abondance, » forcément immobilisée dans les magasins par l'absence de » moyens de transport, a renouvelé pour l'armée le supplice » de Tantale. »

Je ne fais que citer les correspondances officielles rendues publiques par le livre de M. Chenu.

*Valeggio, 7 juillet.* — Les distributions de biscuit sont très-fréquentes; depuis quinze jours, quelques régiments n'ont reçu qu'une ou deux fois du pain de très-mauvaise qualité et présentant des moisissures... Le vin manque complètement; c'est à peine si, en quinze jours, une distribution a été faite... — MERY, médecin en chef de la garde.

*Montebello, 24 mai.* — Je vous informe à regret que, par suite de l'inexpérience ou des préoccupations nombreuses de l'intendance, près de huit cents blessés ont été nourris pendant quatre jours par la comminération publique. Les régiments et les ambulances continuent à manquer de médicaments... — CHAMPOUILLON, médecin en chef du premier corps.

*Castiglione, 2 juin.* — Sire, les blessés de Solferino, entassés à Castiglione, n'ont pas même encore été pansés, faute de moyens suffisants. Nous avons de la charpie, mais pas de linge, pas de chemises, pas de sucre, pas de vivres... — LORRET, hydrographe de la marine.

Nous voyons ce manque du matériel nécessaire pour les pansements ou pour les transports dénoncé dans un grand nombre de rapports. Citons-en quelques-uns.

*Quartier général du 2<sup>e</sup> corps. Sale, 17 mai.* — Vous jugerez de notre embarras et de nos craintes quand vous saurez qu'il n'existe pour toute ressource en matériel dans ce corps d'armée qu'un caisson d'ambulance... Nous faisons faire cinquante brancards, car nous en sommes



complètement dépourvus. Nous manquons également de couvertures... — PÉRIER, médecin en chef du 2<sup>e</sup> corps.

*Alexandrie*, 19 mai. — Pas de litières, pas de cacolets, pas de fourgons; j'ai demandé avec instance du chloroforme, du perchlorure de fer, rien ne m'a encore été livré... — MERY, médecin en chef de la garde.

*Voghera*, 23 mai. — Le 1<sup>er</sup> corps ne possède pas un seul infirmier militaire. L'ambulance du quartier général du 1<sup>er</sup> corps est dépourvue de caissons... — CHAMPOUILLON, médecin en chef du 1<sup>er</sup> corps.

*Montebello*, 26 mai. — Jusqu'ici aucun des régiments compris dans le 1<sup>er</sup> corps n'a reçu les cantines d'ambulance; il en est quelques-uns dont le personnel de santé est réduit à un seul aide-major... — CHAMPOUILLON, médecin en chef du 1<sup>er</sup> corps.

Ce qui, suivant les règles salutaires qui donnent à l'intendance la direction des choses médicales, aboutit non à une mesure énergique et pratique, mais à une seconde édition de la réclamation.

*Alexandrie*, 27 mai. — Monsieur l'intendant général, Le 1<sup>er</sup> corps n'avait pas de caisson à la date du 24 courant... Un fait bien regrettable, exprimé dans le rapport de M. Champouillon, c'est que près de huit cents blessés de Montebello ont été nourris pendant quatre jours par la commiseration publique... — Baron LARREY, médecin en chef de l'armée.

Continuons !

*Livourne*, 31 mai. — La plupart des régiments arrivent de France dépourvus des ressources médico-chirurgicales que doivent contenir les cantines d'ambulance régimentaires et quelquefois des cantines elles-mêmes... — LEGUEST, médecin en chef du 5<sup>e</sup> corps.

*San-Zeno*, 19 juin. — Vous savez que nous n'avons toujours pas de cantine de pharmacie... — PÉRIER, médecin en chef du 2<sup>e</sup> corps.

*Castelnuovo*, 5 juillet. — Depuis l'ouverture de la campagne, les médecins des régiments se plaignent de n'avoir reçu de la pharmacie centrale aucun des médicaments qu'ils ont demandés... — CHAMPOUILLON.

Soyons juste cependant. Les réclamations ont porté leur fruit, et les cantines ont fini par arriver seulement...

*Valenza*, 30 mai. — Les régiments ont reçu des cantines, MAIS ELLES SONT VIDES !!! — CHAMPOUILLON, médecin en chef du 1<sup>er</sup> corps.

S'il faut une preuve plus nette, le médecin en chef nous la fournit lui-même dans une lettre qui met le mal dans tout son jour.

*Milan*, 9 juin. — Monsieur l'intendant général, Une nouvelle bataille semble imminente du côté de Lodi, et il serait bien regrettable que nous fussions encore pris au dépourvu, comme à Magenta, pour assurer et régulariser l'assistance et le transport des blessés... — Baron LARREY.

Ainsi, la médecine a été, à Magenta, au-dessous de sa tâche, elle a été réduite à l'impuissance; nos soldats ont



souffert, plusieurs sont morts faute de soins suffisants, et M. Larrey n'a pas le droit de donner des ordres directs, ne peut prendre les mesures nécessaires, il ne peut que se borner à dire à l'intendance : « Ne soyons plus pris au dépourvu. »

Enfin, il est quelques lettres d'un piquant intérêt, car elles nous montrent que si les soldats n'avaient pas oublié d'emporter leurs fusils, l'intendance avait oublié de mettre à la disposition des chirurgiens militaires les instruments les plus nécessaires à l'accomplissement de leur mission.

*Alexandrie, 17 mai.* — L'imminence d'une grande bataille rendra nécessaires toutes les ressources matérielles de la chirurgie ; et, en fait d'instruments, je tiens beaucoup à ce que la boîte à résections soit fournie d'urgence à chaque ambulance divisionnaire... Veuillez, je vous prie, nous en assurer l'envoi immédiat... — **BARON LARREY.**

« En conséquence, le conseil de santé demanda au ministre de la guerre de vouloir bien faire ajouter la boîte réglementaire n° 16 à l'arsenal chirurgical des ambulances... » — *Correspondance*, p. 39.

La boîte résection des os, réclamée par M. Larrey, est expédiée du magasin central des hôpitaux militaires .. *A l'avenir, toute demande de matériel nécessaire au service de l'armée devra être transmise DIRECTEMENT par l'intendant général...* — *Correspondance*, p. 66.

Traduction libre : Parce que vous manquiez des instruments indispensables, vous avez osé les réclamer directement du ministre ; que cela ne vous arrive plus ! à l'avenir, n'oubliez pas que c'est à l'intendance à laquelle vous devez vous adresser d'abord, car c'est elle qui doit apprécier s'il vous faut ou non des boîtes à résection.

Cette autre lettre est bonne à méditer.

*Brescia, 26 juillet.* — Nous avons tenté la conservation des restes du colonel, mais comme il nous a été impossible de nous procurer à Brescia, même l'apparence d'une seringue à injection cadavérique, sa conservation par ce moyen est devenue impossible... — **ISNARD**, médecin principal.

Heureusement pour la science, nos collègues des États-Unis n'avaient pas besoin de demander à des intendants s'ils pouvaient ou non emporter tel ou tel instrument, car s'ils avaient dû compter sur les seringues à injection égarées dans les forêts de l'Amérique, nous n'aurions pas eu le splendide musée de l'armée à Washington, musée qui est peut-être à l'heure qu'il est le plus riche du monde.

Au manque de ressources matérielles vient s'ajouter, comme en Crimée, grâce aux sages prévisions de l'intendance, le manque de personnel. Ici encore nous arrivons à un véritable défilé de plaintes, de réclamations, à un chassé-croisé de



demandes. Chaque médecin en chef court par lettres à la recherche de ses auxiliaires, et chacun cherche à s'approprier le plus grand nombre possible de collaborateurs, dans l'espoir de ne pas voir se stériliser, faute de médecins, les efforts faits pour sauver les malades.

*Voghera*, 22 mai. — Le service est mal organisé; nous n'avons pas d'infirmiers; quelques musiciens que personne ne commande ont été désignés pour remplacer les infirmiers absents, et ne nous sont pas utiles parce qu'ils ne savent rien. Les malades sont mal couchés, mal nourris, mal soignés... — MARTENOT DE CORDOUX, médecin major.

Puis, toujours suivant la voie hiérarchique, qui certes n'abrége ni les distances ni les délais.

*Alexandrie*, 23 mai. — Monsieur l'intendant général. Le service médical de l'ambulance de Voghera n'est pas suffisamment assuré. Les officiers de santé sont exténués de fatigue; ils n'ont pas d'infirmiers, et se plaignent de ne pouvoir donner à leurs malades des soins plus complets... — Baron LARREY.

L'intendant général prend le lendemain une mesure que l'éloignement, on va le voir, rend efficace.

*Alexandrie*, 24 mai. — J'ai approuvé la désignation de MM. L'honneur et Gaujet pour aller momentanément à l'ambulance de Voghera. — PARIS, intendant général. (Cette réponse, arrivée après l'évacuation des blessés, ces médecins ne sont pas partis)...

*Alexandrie*, 28 mai. — Il y a déjà 150 hommes, blessures légères; mais il n'y a personne pour les visiter, il n'y a rien pour les soigner... — CAZALAS, médecin en chef à Alexandrie.

COROLLAIRE. — *Alexandrie*, 28 mai. — Monsieur l'intendant général. Il n'y a jusqu'ici aucun service médical ou administratif; cette fâcheuse situation, que vient de me faire connaître M. le médecin principal Cazalas, ne peut se prolonger sans de graves inconvénients... — Baron LARREY.

*Valenza*. — Le personnel de quelques ambulances du premier corps est toujours incomplet... — CHAMPOUILLON.

*Montechiaro*, 22 juin. — L'insuffisance du nombre des infirmiers à Novare rend le service des hôpitaux de plus en plus difficile... — Baron LARREY.

La campagne avance, les besoins augmentent, Solferino a jeté sur le sol plus de blessés qu'on n'en peut soigner; enfin l'intendance, le *deus ex machina*, dans un moment de désespoir, confesse son incompétence, et réclame elle-même des secours à celui qui, d'après les lois anti-naturelles de la hiérarchie militaire, ne peut agir que d'après ses ordres.

*Cavriana*, 25 juin 1859. — Monsieur le médecin en chef de l'armée. Un rapport qui m'arrive à l'instant m'apprend qu'il y a énormément de



blessés à Castiglione et que les médecins manquent ; *veuillez, je vous prie, en envoyer sur-le-champ...* — PARIS, intendant général.

Cette insuffisance du personnel, une des causes les plus graves de nos revers et de la fâcheuse infériorité des résultats obtenus par la médecine militaire française, éclate dans tout son jour par le rapprochement de quelques chiffres que nous empruntons à M. Chenu.

En Afrique, en 1830, pour une armée de 30 000 hommes, 180 médecins d'ambulances et hôpitaux de première ligne ou 6 médecins pour 1000 hommes d'effectif.

En Crimée, mai 1855, pour une armée de 108 000 hommes, 78 médecins ou 0,72 médecins pour 1000 hommes d'effectif.

En Italie, juin 1859, pour une armée de 160 000 hommes, 132 médecins ou 0,82 médecins pour 1000 hommes d'effectif.

L'armée d'Italie n'avait que 132 médecins, combien en manquait-il ? D'après le général Roguet, aide-de-camp de l'empereur, qui les réclame au ministre de la guerre, 300 ; deux fois plus que le nombre existant.

M. Larrey n'eût pas demandé mieux, je me plais à le croire, d'avoir un tel nombre d'auxiliaires ; s'il se contente de beaucoup moins, c'est sans doute dans l'espoir qu'une demande plus modeste sera mieux accueillie.

*Alexandrie, 26 mai.* — A monsieur le maréchal Vaillant. Le supplément de 300 médecins militaires demandé par M. le général Roguet à S. Exc. le ministre de la guerre serait effectivement trop considérable... ; mais il devient indispensable et urgent d'obtenir au moins 150 médecins ou chirurgiens détachés des hôpitaux et de régiments de France et d'Algérie... ; mais ce personnel resterait même insuffisant s'il n'était secondé activement, dans les hôpitaux surtout, par un nombre égal de sous-aides provisoires ou auxiliaires empruntés aux élèves des Facultés... — BARON LARREY.

Quel était le nombre des médecins attachés à l'armée prussienne pendant la campagne de 1866?... 1953.

Ce qu'il y a de grave dans cette insuffisance numérique du personnel médical de l'armée, c'est qu'elle n'est pas seulement l'effet du manque accidentel de prévoyance de la part de l'administration. Le nombre des médecins attachés à l'armée en campagne aurait, sans nul doute, été plus grand si l'intendance avait pu, sans trop désorganiser les services, emprunter aux régiments et aux hôpitaux de l'intérieur les chirurgiens indispensables au fonctionnement des ambulances. Malheureusement elle ne le pouvait pas, car l'administration de la guerre ne peut plus, depuis longues années, arriver à remplir le cadre des officiers de santé militaire. C'est un point sur



lequel M. Chenu attire vivement l'attention, et il a consacré à l'examen de cette question quelques-unes des plus éloquentes pages de son livre. L'insuffisance numérique du personnel médical tient, d'une part, au nombre considérable des démissions, et, d'autre part, à la difficulté de recruter de nouveaux candidats.

Jeune, sans expérience, on entre dans la chirurgie militaire avec l'intention bien arrêtée d'y faire une honorable carrière. Bientôt, avec la maturité de l'esprit, avec la science vient un sentiment plus vif de la dignité personnelle et professionnelle ; la situation déplorable faite aux chirurgiens militaires, les froissements de toute nature amènent les démissions ; elles se succèdent sans interruption, et, comme le prouve M. Chenu, aucun corps de l'armée ne présente un pareil exemple de désertion et de décadence dans le personnel.

Les pertes annuelles des différents corps d'officiers de l'armée française pour cause de démission sont en moyenne : pour l'infanterie, de 0,20 pour 100 ; pour la cavalerie, 0,39 ; pour l'état-major, 0,31 ; pour l'artillerie, 0,22 ; pour le génie, 0,12 ; elle fut pour le corps de santé de 4,67 pour 100 de 1846 à 1852 ; de 2,44 pour 100 de 1852 à 1859 ; de 4,13 de 1859 à 1865.

C'est encore bien pis pour le recrutement. A une époque où toutes les carrières sont encombrées, où les candidats se pressent en foule aux concours de Saint-Cyr et de l'École polytechnique, la chirurgie militaire, même en acceptant tous les candidats *admissibles*, même en « faisant appel à la misère, à la besogneuse anxiété des parents pauvres », en créant, contrairement à la loi, des docteurs en médecine reçus après quatre années seulement d'études y compris la période des examens, ne parvient pas à compléter ses cadres. Sur 400 élèves entrés à l'école de médecine militaire en 1868, 80,4 pour 100 ont été admis avec bourse et demi-bourse, et sur ce nombre la moitié reçoivent bourse entière et trousseau.

Après avoir supprimé les hôpitaux d'instruction, on crut pouvoir assurer le recrutement en alléchant de jeunes docteurs par le grade d'aide-major obtenu après une année de séjour au Val-de-Grâce. Mais lorsqu'un élève a pu, à l'aide des sacrifices que s'est imposés sa famille, arriver au doctorat, il est fort peu disposé à aliéner sa liberté en embrassant une carrière qui ne lui promet guère que des ennuis, quand il a la certitude d'arriver, par la pratique civile, à l'indépendance, à une honorable aisance, à la considération et à l'estime publique. Mais la pratique civile c'est l'*alea*, la lutte, le *struggle for life* ; beau-



coup, dans notre bon pays, lui préfèrent, même à vingt-cinq ans, la douce quiétude que donne l'assurance d'avoir à signer tous les mois une feuille d'émargements, et d'arriver par l'ancienneté à avoir le droit d'aller, vieux garçons, vieillir en dépensant la solde de retraite dans quelque petite ville de province. A côté de ceux-ci se trouvaient d'anciens internes des hôpitaux civils, quelques jeunes confrères instruits, qui n'embrassaient la carrière militaire que parce qu'ils avaient l'espoir fondé de conquérir, par leurs habitudes de travail et d'étude, une situation exceptionnelle, à côté de l'élite d'hommes distingués qui, dans les hôpitaux militaires, honorent à la fois le corps auquel ils appartiennent et la profession tout entière. Ceux-ci malheureusement sont en fort petit nombre, et beaucoup, quand ils le peuvent, donnent leur démission lorsque l'expérience leur apprend ce que vaut la carrière dans laquelle ils sont entrés. A l'insuffisance numérique se joint trop souvent l'insuffisance scientifique, et si j'appelle l'attention sur ce point, ce n'est pas seulement parce que c'est pour moi une vérité et que je professe, que toute vérité est bonne à dire, quoiqu'il arrive, mais surtout parce que cette insuffisance est le résultat fatal d'une organisation défectueuse, qui est le fait de l'administration, et contre laquelle s'élèvent à bon droit beaucoup de nos collègues de l'armée.

En France, les médecins militaires sont partagés en deux classes : ceux qui sont attachés aux hôpitaux, ceux qui sont attachés aux corps de troupe. Le médecin de régiment fait chaque jour la visite des hommes qui se présentent à l'infirmerie ; il y retient et y soigne ceux qui n'ont qu'une légère indisposition, puis il envoie à l'hôpital ceux qui sont réellement malades ; mais ceux-là il ne les soigne pas, le service de l'hôpital n'étant pas dans ses attributions, et, quand il a pendant plusieurs années vécu de cette existence, on peut être sûr que ses connaissances médicales ont été en s'affaiblissant.

Sans doute, le médecin de régiment peut devenir médecin d'hôpital ; mais il faut pour cela qu'il subisse un concours, et s'il se contente d'avancer à l'ancienneté, il peut presque indéfiniment rester éloigné des hôpitaux. Cependant, qu'une guerre survienne, et la nécessité forcera de donner à ce médecin un service d'hôpital qu'on ne croyait pas devoir lui confier en temps de paix. C'est là une situation grave qui réclame une réforme radicale. En Russie, en Autriche, en Prusse, chaque régiment a son hôpital, et les soldats du régiment y sont soignés par le médecin du corps. Lorsque l'hôpital est important, lorsqu'il est affecté à plusieurs régiments, comme le Garnison-Lazareth



de Berlin, la direction générale est confiée à un médecin militaire d'un grade supérieur. Celui-ci a le titre et les fonctions de médecin en chef, mais des salles particulières sont affectées aux malades de chacun des régiments placés dans le ressort de l'hôpital, et ces malades y sont traités par leur propre médecin.

Il ne nous appartient pas de nous étendre davantage sur ce sujet, mais nous avons la conviction profonde que l'organisation qui affecte à chaque régiment, sous le nom de *compagnie de santé*, un service médical complet comme personnel et matériel, est de beaucoup préférable à notre organisation actuelle.

Revenons à l'examen des faits médicaux de la campagne d'Italie.

L'administration de la guerre pouvait-elle remédier à cette insuffisance du personnel médical? Le doute n'est pas permis à cet égard. Rien n'était plus facile que d'envoyer à l'armée d'Italie les médecins militaires attachés à des hôpitaux de l'intérieur, et de les faire remplacer par des médecins civils. Il y a plus, on pouvait, comme l'ont fait ailleurs les Prussiens, les Anglais, les Américains, envoyer dans les hôpitaux de Gênes, Milan, Alexandrie, Brescia, Turin, des médecins civils capables de rendre les plus grands services; mais le moyen eût été trop simple, et l'administration se fût bien donné de garde d'y avoir recours. A ce sujet, mon histoire personnelle peut servir d'exemple.

Ancien chirurgien militaire, ancien interne des hôpitaux de Paris, aide d'anatomie à la Faculté, ayant le droit de croire que je pouvais être utile, ayant la volonté de l'être, j'offris mes services gratuits à l'administration de la guerre dès le début de la campagne. On refusa, cela va sans dire, et ce ne fut que beaucoup plus tard, et je puis dire trop tard, que l'on me fit l'honneur de me permettre d'offrir aux blessés mon temps, mes fatigues et mon argent, alors que depuis plus d'un mois on était réduit à implorer le secours, non pas seulement de nos confrères d'Italie, mais d'élèves en médecine italiens, dont la plupart n'avaient fait que s'asseoir quelques mois sur les bancs de l'école. Du reste, il faut bien que je le dise pour ceux qui, dans de pareilles circonstances, seraient tentés de se dévouer, ils sont sûrs de ne rencontrer qu'un médiocre accueil; et ils feront bien de méditer cette lettre, non plus cette fois d'un intendant, mais d'un médecin.

Paris, 31 mai 1859. — A monsieur le médecin en chef de l'armée... Mais le conseil vous prie instamment, très-cher collègue, de ne pas perdre de vue que les médecins militaires doivent se suffire à eux-mêmes sur





les champs de bataille, dans les ambulances et les hôpitaux temporaires..., et que des médecins étrangers à l'armée ne devront figurer dans leurs rangs qu'à titre tout à fait exceptionnel et temporaire, même pour les fonctions subalternes, les seules qui puissent leur être confiées... — VAILLANT, président du conseil de santé.

J'ai eu l'honneur de rencontrer au siège de Düppel les professeurs Klopsk (de Breslau), Esmarch (de Kiel), Langenbeck (de Berlin); peut-être, dans l'armée française, eût-on daigné leur confier la tenue des cahiers de visite de quelque aide-major novice. Mais de ce que la chirurgie militaire française n'est pas aussi hospitalière qu'elle pourrait l'être et que ne l'est la chirurgie étrangère, cela ne nous empêche pas de montrer que ses désastres ne sont pas de son fait, mais du fait d'une mauvaise organisation qui pèse sur elle, paralyse ses efforts et la met dans l'impuissance de rendre les services qu'on pourrait attendre de l'activité, du dévouement et de la science de ceux qui la composent. La responsabilité remonte de droit à l'intendance militaire; chercher à le prouver c'est chercher, par cela même, à sauver dans l'avenir la vie de nos soldats.

Au nombre insuffisant des médecins venait s'ajouter l'insuffisance des moyens mis à leur disposition, et la bonne volonté de l'administration fut telle à leur égard que sur les 10 206 chevaux de l'armée d'Italie on ne put en trouver quelques-uns pour permettre aux chirurgiens militaires l'accomplissement de leur mission.

*Valenza*, 22 mai. — MM. Lefebvre, Alix et Vital, n'ayant encore pu obtenir de chevaux, sont arrivés en tenue et perchés sur un caisson d'ambulance. — FENIN, médecin en chef du quatrième corps.

*Travagliato*, 17 juin. — Plusieurs médecins de l'ambulance du grand quartier général ne sont pas montés; ils font les étapes à pied ou perchés sur les caissons. Cela n'est pas digne d'une part, et de l'autre cela est nuisible au service. — BERTHERAND, médecin en chef du grand quartier général.

En Amérique, le médecin ayant droit de réquisition n'eût eu besoin de s'adresser à personne; dans l'armée française, la réclamation suit la voie ordinaire : l'ordre hiérarchique et la voie épistolaire, alors même qu'il s'agit de faits qui se passent dans le village où séjournent momentanément le médecin qui réclame, le médecin en chef qui transmet la réclamation et l'intendant général qui l'accueille... à la façon ordinaire.

*Travagliato*, 17 juin. — Monsieur l'intendant général. Plusieurs médecins de l'ambulance du grand quartier général... sont obligés de faire les routes à pied ou sur des caissons. Cette situation n'est pas seulement



peu convenable pour eux..., etc. Ne serait-il pas possible d'obvier à cet inconvénient par telle mesure qu'il ne m'appartient pas d'indiquer ? — Baron LARREY.

Du reste, comment s'étonner de l'insuccès des demandes du chirurgien en chef de l'armée quand on voit sa situation si bien caractérisée par cette lettre ?

*Alexandrie*, 20 mai 1859. — Monsieur l'intendant général. Je n'ai personne auprès de moi, pas même un planton ou un soldat d'ordonnance, et je suis obligé de suffire seul à l'expédition des dépêches, que je fais porter par un domestique civil... — Baron LARREY.

Mais le corps médical sait facilement souffrir sans se plaindre ; trop facilement peut-être ; car si, en présence de l'inutilité des réclamations, alors qu'il s'agissait de la vie des blessés et des malades, quelques démissions éclatantes eussent été données, la voix publique eût forcé les obstacles. Hélas ! il n'en eût pas été ainsi, et j'ai tort d'écrire cette phrase, qui ressemble à un blâme ; j'oublie que je parle de faits qui se sont passés en 1854, que c'est en Angleterre seulement, dans la grande nation, que la presse, libre dans un pays libre, a pu porter remède aux funestes effets de la mauvaise organisation des ambulances de Crimée ; j'oublie que la démission d'un de nos éminents collègues de l'armée n'aurait pour résultat que de briser sa carrière, sans utilité pour personne ; que la démission, dans quelques cas, est comme le suicide, et qu'au repos dans la mort il est plus courageux et plus digne, quand il s'agit de sauver ses semblables, de consumer sa vie dans la lutte, cette lutte dût-elle être stérile.

L'état des médecins n'est pas meilleur en Crimée qu'il ne fut plus tard en Italie.

*Gallipoli*, 4 mai 1854. — Monsieur le président du conseil de santé. J'ai trouvé les médecins qui m'ont précédé dans une situation morale peu satisfaisante, par suite de la position qui leur a été faite... On leur a refusé des ordonnances, et ils ont été obligés d'aller eux-mêmes aux magasins chercher leurs rations de vivres, de faire leur cuisine, et même de panser leurs chevaux et d'aller aux fourrages... — SCRIVE, médecin en chef de l'armée d'Orient.

Quel exemple nous donne la Crimée ! Là, deux armées amies sont en présence, soumises aux mêmes misères atmosphériques, se heurtant aux mêmes difficultés matérielles, exposées aux mêmes risques, menacées des mêmes fléaux : le choléra, le typhus ; quel fut le sort de l'une et de l'autre ?

L'armée française a sur les armées anglaise et américaine l'avantage d'être toujours prête à entrer en campagne ; avan-



tage qui, malheureusement pour le pays tout entier, se compense par le fléau de la conscription, par l'oisiveté imposée chaque année et pour sept ans à 80 000 travailleurs, par l'interdiction du mariage à la partie la plus solide de la population, par une dégénérescence physique de la race, par un affaiblissement dans l'accroissement de la population, par des dépenses improductives. Mais si une guerre éclate à l'improviste, les services administratifs et médicaux sont à peu près organisés, et dans les premiers jours la situation est tolérable.

En Angleterre, en Amérique, la guerre n'est qu'un état anormal, une éventualité dont on a d'autant moins à se préoccuper qu'elle ne peut se présenter qu'avec l'assentiment du pays. L'Angleterre ne conserve d'armée que ce qui est nécessaire à la défense. L'Amérique, plus heureuse encore, n'a guère d'autre armée que celle de ses énergiques et audacieux travailleurs, et sitôt la guerre finie, elle a licencié les onze cent mille défenseurs de l'Union américaine et vendu presque tout son matériel de guerre. Mais comme on n'improvise pas facilement les services des subsistances, celui des ambulances, l'Amérique, jusqu'à la bataille de Bulls-Run, a souffert de cruelles pertes, et l'armée anglaise en Crimée a été bien heureuse de trouver auprès d'elle les secours de l'armée française.

Pendant le premier hiver passé devant Sébastopol, l'armée française trouvait dans ses approvisionnements antérieurs des ressources qui manquaient à nos alliés; aussi l'armée anglaise souffrant davantage, le chiffre de sa mortalité devait, en s'élevant, témoigner de ces souffrances. En effet, de novembre 1854 à avril 1855, dans une période de six mois, l'armée anglaise perdit 40 889 hommes, et l'armée française 10 934; mais comme l'effectif moyen de la première (34 000) était moins de la moitié moins fort que celui de la seconde (79 000), l'armée anglaise subit une perte relativement plus de deux fois plus grande que celle de l'armée française.

Mais en Angleterre, comme je l'ai déjà dit, rien ne peut échapper au salutaire contrôle de la presse. Ces désastres furent signalés, l'opinion publique s'émut; la plus grande latitude fut donnée par le gouvernement à l'action du corps médical; miss Nightingale partit pour l'Orient, officiellement accréditée auprès du général en chef; 50 000 chemises de flanelle et de coton, 23 000 paires de bas, 6843 caleçons de laine, 4004 robes de chambre, des gants, des cache-nez, des vivres frais, 253 caisses de conserves furent mis à la disposition des malades.



Le fort de Malakoff est pris au mois de septembre ; mais les forts du Nord résistent encore, la paix n'est pas faite, un second hivernage est probable, l'expérience du passé a parlé. Que va-t-il arriver ?

Les Anglais, à l'instigation du corps médical et de miss Nightingale, imaginent cette baraque si bien conçue sous le rapport de l'hygiène, et qui est depuis connue en hygiène sous le nom de *Crimean Hut*. Toute l'infanterie anglaise, chaudement logée, bien nourrie, bien vêtue, passe l'hiver à l'abri de toutes ces causes de mort qui avaient si puissamment et si malheureusement agi sur elle pendant l'hiver précédent.

L'administration française, omnipotente dans son incompetence, imprévoyante à l'extrême, malgré les avertissements réitérés de Scrive, de M. Michel Lévy, ne veut pas comprendre qu'elle n'a plus à diriger une armée fraîchement débarquée, ayant en quelque sorte apporté avec elle une provision de santé aujourd'hui épuisée, mais des hommes affaiblis, harassés par les fatigues d'un long siège, débilités par les privations, privés de ce ressort que la lutte donne au soldat français ; des hommes enfin qui sont tous plus ou moins en imminence morbide, tout prêts à être la proie de cette maladie qu'engendre la misère et l'encombrement : le typhus des camps. Et alors ! dans ces six mois d'hiver 1855-1856, pendant que les Français ont 323 blessés et les Anglais 165 ; les Anglais, grâce aux précautions prises, perdent 606 hommes, les Français, grâce à l'imprévoyance, à l'obstination d'une administration, qu'au dire de certaines gens d'un patriotisme niais, toute l'Europe nous envie, perdent 21 190 hommes !!

Veut-on des preuves de cette incapacité de l'intendance elles abondent.

Le corps médical français conseille des mesures, l'intendance les rejette ; les Anglais les adoptent et ne laissent à nos médecins que le regret de leur impuissance.

*Gallipoli*, 3 juin. — Monsieur l'intendant en chef de l'armée. J'ai déjà eu plusieurs fois l'honneur de vous entretenir des diverses mesures qui me paraissent pouvoir assurer le service de l'armée d'Orient... Il est indispensable d'avoir à sa disposition au moins trois grands centres hospitaliers... ; l'autre enfin devrait être à Smyrne, où se trouve une grande caserne qu'il serait facile de transformer (*ce projet n'ayant pas été adopté, les Anglais ont immédiatement établi un de leurs hôpitaux à Smyrne*)... — SCRIVE, médecin en chef de l'armée d'Orient.

*Varna*, 9 août 1854. — Dans le premier moment de l'encombrement si soudain, si considérable de tant de malades et de cholériques, dont beaucoup ont expiré en débarquant et pendant leur translation, j'avais



proposé de transformer, pour douze ou quinze jours, deux navires de la flotte en hôpitaux flottants ; cette idée n'a pu être mise à exécution par suite de considérations que j'ignore ; j'ai appris depuis que les Anglais ont établi deux hôpitaux flottants... Je ne puis que regretter que mon initiative n'ait pu obtenir autant d'efficacité que celle de l'inspecteur général du service de santé anglais... — MICHEL LÉVY, inspecteur du service de santé.

Varna, 31 août 1854. — Monsieur le maréchal... Dans ce pays de torpeur et d'inertie, il existe une industrie, la construction des baraques... J'ai conseillé l'établissement d'hôpitaux en baraques. M. l'intendant adopte ce parti. A quand l'exécution ? — MICHEL LÉVY.

Varna, 18 septembre. — Monsieur le maréchal... Mais ce qu'il importe d'obtenir au plus tôt ce sont des baraques ; l'hiver approche, et je vois avec inquiétude que nulle mesure n'est encore prise pour assurer les quartiers d'hiver. Les Anglais ont déjà fait construire à Gallipoli d'excellentes et vastes baraques, qui, avec les immenses bâtiments dont ils ont pris possession à Scutari et sur le Bosphore, suffiront probablement à leur casernement d'hiver... — MICHEL LÉVY.

N° 61. — Le service hospitalier des Anglais profite de l'influence favorable d'une direction absolue par le corps médical, qui a le droit d'exprimer les besoins éprouvés, en même temps que celui d'y satisfaire largement sous sa responsabilité : aussi devons-nous convenir que, réduits au strict nécessaire, nous sommes bien pauvres dans notre hospitalisation, devant le luxe et le confort des établissements de nos voisins et alliés... — SCRIVE, médecin en chef de l'armée d'Orient.

N° 62. — Dans le camp anglais... l'alimentation ne laisse rien à désirer... Était-il possible de faire jouir l'armée française de si magnifiques avantages ? Je réponds négativement, parce que les règles fondamentales du système que la France a adopté s'y refusent formellement... — SCRIVE.

N° 73. — L'installation plus que médiocre de nos infirmeries contrastait désavantageusement avec celle des infirmeries anglaises, qui étaient luxueusement constituées... Les Anglais, qui avaient reçu une terrible leçon au début de la guerre, avaient, au second hivernage, pris une superbe revanche. — SCRIVE, médecin en chef.

Constantinople, 5 février 1856. — Pendant ce temps, nos alliés, les Anglais, nous offrirent des ressources de toute nature en personnel et en matériel. Le général Storks nous proposait d'aller installer dans un de nos camps un hôpital complet pour mille malades, de nourrir même et de traiter les malades si on le désirait. Quoi que nous fassions, disait-il, nous ne nous acquitterons jamais de ce que les Français ont fait pour nous l'an dernier... — BAUDENS, inspecteur du service de santé.

Mais, en voilà assez sur ce point ; j'ai dit que le corps médical français n'était pas responsable de l'effroyable désastre de la Crimée, de la mort de 75 000 malades ; il ne me sera pas difficile, avec les preuves contenues dans le livre de M. Chenu, de montrer à qui incombe la responsabilité.



Deux épidémies terribles frappèrent l'armée française en Turquie et en Crimée, en 1854 le choléra, en 1855 le typhus; l'une dont on peut arrêter l'extension par des mesures de précaution; l'autre dont on peut empêcher le développement, et à tout le moins diminuer les ravages, puisque l'on savait depuis longtemps pourquoi le typhus se développe et comment il se propage. On le savait; aussi les chefs médicaux de l'armée, privés de toute initiative, firent-ils un incessant appel à l'action de cette intendance militaire qui s'est approprié le droit exclusif d'agir; mais en vain Scrive, Baudens, M. Michel Lévy réclament l'érection de tentes, de baraques, signalent le danger de ces évacuations qui augmentent le péril, le font naître là où il n'était pas et sèment la mort et le deuil partout où elles passent; rien ne se fait, ou se fait trop tard. Cette correspondance dont nous ne citons que de courts extraits est navrante; mais elle doit être la condamnation d'une organisation dont la nocuité éclate à chaque ligne.

*Constantinople, 12 juillet 1854. — ... Que Votre Excellence me permette cet aveu: je suis effrayé de la fixation de 2100 malades pour l'hôpital de Péra, le bel édifice... ne sera bientôt qu'un vaste foyer d'infection. 500 à 600 malades par hôpital, tel est le chiffre que l'expérience autorise... — MICHEL LÉVY, inspecteur du service de santé.*

Résultat :

*Constantinople, 29 novembre 1854. — Depuis que l'hôpital de Péra compte plus de 1200 malades, l'infection purulente s'y multiplie chez les blessés... Si je n'étais pas un directeur purement nominal du service de santé, j'aurais les droits et l'initiative nécessaires pour prévenir de pareils dangers; mais j'ai dû me borner à les notifier à M. l'intendant, qui me répond placidement : Je les déplore avec vous, mais le moment ne me paraît pas venu d'y apporter le remède que vous indiquez. — MICHEL LÉVY.*

Autre exemple.

*Constantinople, 29 novembre 1854. — Monsieur le maréchal. L'hôpital Daoud-Pacha aura 1200 lits de malades au premier étage; son rez-de-chaussée loge 1500 soldats convalescents; sa cour est encombrée de tentes-abris qu'habitent d'autres militaires sortis de convalescence. Voilà un hôpital créé contre mon avis et malgré mes résistances... La suite édifiera Votre Excellence sur les résultats de cette expérience. — MICHEL LÉVY.*

Résultat :

Le 20 janvier 1856, 1140 malades présents à l'hôpital Daoud-Pacha; mortalité du mois jusqu'à ce jour, 100. C'est précisément à dater de ce moment que le typhus a commencé à sévir; il avait fallu rapprocher les lits... Le mal s'accroît rapidement, suivant pas à pas le progrès de l'en-



combement dans les salles. — GARREAU, médecin en chef de l'hôpital de Daoud-Pacha.

Michel Lévy, Baudens réclament l'érection de baraques.

Constantinople, 5 février 1856. — J'insistai vivement auprès de l'intendant militaire pour qu'on plaçât les typhiques dans des salles spéciales où l'on pût distribuer l'air libéralement ; c'était en même temps soustraire les autres malades aux dangers de la contagion. Il fallait ainsi créer de nouveaux hôpitaux sous baraques pour empêcher l'encombrement, trouver 5000 places... — BAUDENS, inspecteur du service de santé.

Constantinople, 11 février 1856. — Votre Excellence sait qu'il y a à petite distance de Constantinople des baraques pour loger environ 25 000 hommes, et qu'en vingt-quatre heures il est facile de convertir ces baraques en bons hôpitaux. — BAUDENS.

Constantinople, 28 février. — Nous avons des baraques pour loger 25 000 soldats, *elles attendent une population !* Hâtons-nous de les occuper... Pourquoi n'allons-nous pas plus vite?... Votre Excellence prescrit d'envoyer à Constantinople les soldats malingres des régiments de Crimée. Cette mesure, monsieur le maréchal, pouvait être bonne quand je l'ai conseillée ; *ces malingres sont aujourd'hui des malades...* — BAUDENS.

Constantinople, 3 mars 1856. — La contagion continue ses progrès... Des 5000 places que je réclame j'en ai obtenu 1000... J'ai beaucoup de peine à détruire, dans l'esprit du commandement et de l'administration, une sécurité grosse de dangers... — BAUDENS.

Enfin ! une haute intervention mit fin à ces attermolements homicides.

Paris, 15 mars 1856. — Monsieur l'inspecteur... L'empereur m'a écrit ce matin... « Ce qui est essentiel, c'est d'établir le plus vite possible les ambulances sous baraques que réclame M. Baudens » ; donnez des ordres pressants en conséquence... — Maréchal VAILLANT.

Veut-on une dernière preuve de l'efficacité du rôle du médecin dans l'armée française, qu'on médite cette lettre si digne de M. Michel Lévy.

Constantinople, 20 novembre 1854. — Monsieur le maréchal, ministre de la guerre. L'épuisement de ma santé par cinq mois de luttas au milieu des circonstances les plus pénibles et les plus critiques me fait désirer que Votre Excellence veuille bien mettre un terme à ma mission. Celle-ci d'ailleurs devient chaque jour plus difficile à concilier avec l'action de l'intendance, telle qu'elle entend l'exercer, en vertu de la législation existante, jusque dans un ordre de faits qui échappe à son appréciation. Tant que les circonstances ont commandé l'abnégation, je me suis tû... L'inspecteur médical de l'armée d'Orient est contraint, pour donner force exécutoire à ses désignations, de les soumettre à la sanction de M. l'intendant... Qu'il me soit donc permis d'exposer à Votre Excellence l'état de ma santé, qui ne me laisse pas la force de continuer une sorte d'expérience où j'ai épuisé, sous les enseignes d'une direction purement nomi-



nale, ce que j'ai de prudence, de réserve et d'humilité... — MICHEL LÉVY.

Ce n'est pas assez pour le médecin militaire français de voir ses efforts paralysés par l'intendance, il faut encore qu'il soit sous sa dépendance directe, à tel point qu'un sous-intendant militaire peut infliger une punition disciplinaire à un docteur en médecine.

*Constantinople*, 23 novembre 1854. — Monsieur le maréchal. Il était réservé à M. l'intendant de Constantinople de multiplier ici pour moi les froissements et les difficultés. Après avoir adressé par écrit de dures menaces de punition à un éminent vétérinaire de la chirurgie, M. Scoutetten, qui a tout quitté pour accourir en Orient, il se hâte d'établir sa supériorité hiérarchique devant un inspecteur qui... — MICHEL LÉVY.

S'il n'y eut ici que des menaces, il m'a été donné d'assister à leur réalisation.

C'était à Milan, en 1859. Le médecin en chef des hôpitaux de Milan, M. Cuveiller, avait cru devoir écrire à la fin de la campagne une lettre de remerciements aux confrères de la ville qui nous avaient apporté leurs services dans les soins à donner aux blessés. Un beau matin, on convoque à l'hôpital San Ambrogio tous les médecins militaires présents à Milan, les sous-aides requis, parmi lesquels je comptais, et sans doute pour que la gloire de l'intendance fût mieux établie, les médecins civils italiens attachés aux divers hôpitaux. Le motif de cette réunion devait bientôt être expliqué. M. le sous-intendant de Laval... se présente et commence la lecture d'une lettre commençant à peu près ainsi : « Un médecin militaire a cru pouvoir adresser une circulaire... — Pardon, répond notre éminent confrère, cette lettre, écrite de ma main, n'est pas une circulaire... — Vous ferez quinze jours d'arrêt, pour cette observation... » Telle fut la réplique de ce monsieur.

Or, je le demande, quel est le médecin soucieux de sa dignité professionnelle, qui, n'ayant pas à y poursuivre une carrière commencée, voudrait entrer dans un corps auquel est faite une telle situation. Quant à moi, je le déclare bien haut, jeune, sans expérience, j'ai débuté par la chirurgie militaire. Heureusement ma situation d'élève ne me mit en rapport qu'avec mes chefs naturels, mes premiers maîtres, pour lesquels j'ai conservé les meilleurs sentiments de respect, d'amitié et de reconnaissance ; par devoir et dans l'espoir d'être utile, j'ai sollicité comme une faveur de faire partie de l'armée d'Italie ; l'expérience cette fois m'a éclairé. Si la France devait entrer dans de nouvelles luttes, je partirais encore, seul ou avec mes



élèves, mais je ne le ferais que si, sous la pression toute puissante de besoins immenses, un changement radical avait lieu ; mais tant que les choses resteront dans l'état où elles sont, je continuerai à regarder comme un devoir d'honneur, de détourner tous ceux qui me demandent conseil, du dessein d'entrer dans une carrière où le médecin, à côté de désavantages personnels, de déboires de toute sorte, ne trouve même pas la consolation de pouvoir être utile dans la mesure de sa volonté et de son savoir.

La suprématie de l'intendance militaire ne saurait se tolérer plus longtemps ; assez de victimes ont été sacrifiées. Les désastres de la Crimée, les tristes résultats de la campagne d'Italie, la comparaison avec ce qui se passe et s'est passé à l'étranger, ne permet pas l'hésitation. Il faut un changement et un changement radical d'autant plus nécessaire, d'autant plus urgent, que la faute est non dans les hommes, mais dans l'institution. Ce ne sont pas les intendants qui sont coupables, c'est l'intendance, et il lui est injustement attribué un rôle prédominant dans l'organisation des secours médicaux. Personne ne songe à accuser les administrateurs ; mais plus leur zèle et leur dévouement ont été grands, plus leurs fatigues ont été extrêmes (et celles de la campagne de Crimée n'ont pas été étrangères à la mort de l'intendant en chef Blanchot, comme celles de la campagne d'Italie ont envoyé mourir à Amélie-les-Bains l'intendant en chef Paris), plus cela prouve que le système est mauvais, puisque malgré l'intelligence, l'activité des intendants, les résultats sont déplorables.

Il s'agit ici du salut de l'armée. Une mauvaise organisation est plus meurtrière que les balles de l'ennemi. Les Russes nous ont tué 20 000 hommes, le choléra, le typhus, les misères, les besoins de toute nature, la mauvaise alimentation, le manque de vêtements et d'abris convenables, ont coûté la vie à 75 000 de nos soldats ! Qui oserait dire que la campagne d'Italie n'aurait pas vu de pareils malheurs si, au lieu de durer trois mois, elle se fût prolongée six mois encore !

Je ne puis que répéter ce que je disais il y a un an dans ce journal en rendant compte des résultats chirurgicaux de la guerre d'Amérique. Plus heureuse que la chirurgie française, la chirurgie américaine ne connaît pas l'intendance militaire ; aussi, quoique l'armée fédérale ait compté, pendant deux années seulement, ce chiffre énorme de 2 247 403 malades et de 143 348 blessés, la chirurgie américaine, livrée à elle-même et pouvant déployer toute son énergie, toute son initiative et mettre à profit ses connaissances spéciales, sut ouvrir



aux soldats blessés et malades 202 hôpitaux, renfermant 436 894 lits, et les soigner de telle sorte qu'elle ne perdit que 33 pour 400 de ses opérés, tandis que la médecine française, en tutelle de l'intendance, paralysée par elle, n'eut à sa disposition que des hôpitaux insuffisants, des ressources dérisoires, et perdit en Crimée 72 pour 400, et en Italie 63 pour 400 de ses opérés.

Aussi, c'est avec un légitime orgueil, c'est avec l'autorité d'une grande expérience, c'est avec la preuve évidente, palpable, que renferment les faits accomplis, que notre éminent confrère le docteur Barnes, chirurgien général de l'armée américaine, montre ce que peut faire le corps médical débarrassé de nuisibles entraves : « Jamais dans l'histoire du monde un si vaste ensemble d'hôpitaux ne fut créé en aussi peu de temps; jamais on ne vit en temps de guerre d'hôpitaux si peu encombrés et si largement fournis de tout; mais ils différaient des hôpitaux des autres nations en ce qu'ils étaient dirigés par des médecins. *Au lieu de placer à la tête d'établissements consacrés au soulagement des malades et des blessés, des officiers de l'armée qui, quelles que puissent être leurs autres qualités, ne sauraient comprendre ce que réclame la science médicale, et qui, avec les meilleures intentions du monde, peuvent gravement compromettre le succès des soins du chirurgien, comme ce fut malheureusement le cas dans la guerre de Crimée et comme cela s'est vu depuis dans les hôpitaux anglais, notre gouvernement, avec la plus sage confiance, fit du chirurgien le chef, le commandant de l'hôpital, et tandis qu'il le rendait responsable de ses mesures organisatrices, il lui mettait entre les mains le pouvoir de rendre les résultats favorables. Le corps médical peut montrer avec orgueil les effets de cette libérale mesure; jamais auparavant, dans l'histoire du monde, la mortalité des hôpitaux militaires ne fut si faible en temps de guerre, et jamais ces hôpitaux ne furent aussi complètement garantis des maladies qui y prennent naissance. (Circulaire n° 6.)*

Le corps médical, libre en Amérique, en Russie, en Prusse, doit être, en France, délivré de l'esclavage qui pèse sur lui; il y va du salut de nos soldats, de l'avenir de la médecine militaire. La multiplicité, la diversité de ses attributions ont pour seul effet de rendre l'intendance incapable de remplir aucun des rôles qui lui sont attribués. Elle doit veiller aux subsistances : partout, en Italie, le pain a manqué; bien des régiments ont dû pendant de longs jours ne vivre que de biscuit; partout le vin a fait défaut dans un pays couvert de vignes; les distributions de riz n'ont pu être faites au milieu d'une contrée



qui fournit la plus grande partie du riz qui se consomme en Europe. La viande seule a été abondante et de bonne qualité; mais la fourniture de la viande avait été enlevée à l'intendance et donnée à l'industrie privée.

L'intendance doit s'occuper du matériel : partout, en Crimée comme en Italie, le matériel a fait défaut; pas de cantines, pas de linge, pas de médicaments, tel est le cri qui se répète dans toutes les ambulances.

L'intendance a la direction du personnel médical : partout le personnel a été insuffisant.

L'intendance a la mission de faire relever les blessés, tous ceux de Solferino n'étaient pas encore relevés le 29 juin, QUATRE JOURS après la bataille ! Il est temps qu'on mette fin à un pareil état de choses.

C'est au développement de cette pensée qu'est consacré le livre de M. Chenu. On lira avec un grand intérêt les premiers chapitres dans lesquels il traite avec détail, avec autorité, un sujet que je n'ai pu qu'ébaucher. L'un de ces chapitres est consacré à l'étude d'une science qu'il appartient au médecin d'approfondir et de mettre en pratique. La science de la conservation des armées importe à la nation tout entière, puisqu'elle protège et défend la vie des citoyens appelés sous les drapeaux; elle importe au général, car pour vaincre il faut une armée de soldats et non une armée de malades.

LÉON LE FORT.







RELATION  
MEDICO-CHIRURGICALE  
DE L'ESPÈCE  
DU BOU-TNALES

(PROVINCE DE CONSTANTINE)

PAR LE DOCTEUR  
MÉDECIN CHIEF DE L'HÔPITAL MILITAIRE DE CONSTANTINE  
ET DE LA CLINIQUE DE LA FÉLIEUX, SUR LES INDICATIONS DES  
MÉDECINS, AINSI QU'UN TRAITÉMENT, ETC.

PAR C. SHRIMPTON, M. D.

CHIRURGIEN EN CHEF DE L'HÔPITAL MILITAIRE DE CONSTANTINE

ET DE LA CLINIQUE DE LA FÉLIEUX, SUR LES INDICATIONS DES

MÉDECINS, AINSI QU'UN TRAITÉMENT, ETC.

LA MÉDECINE MILITAIRE.

« Ce livre est le résultat de l'expérience de l'auteur, qui a été  
recueillie pendant sa mission en Algérie, et qui est le fruit de  
son observation personnelle et de ses recherches.

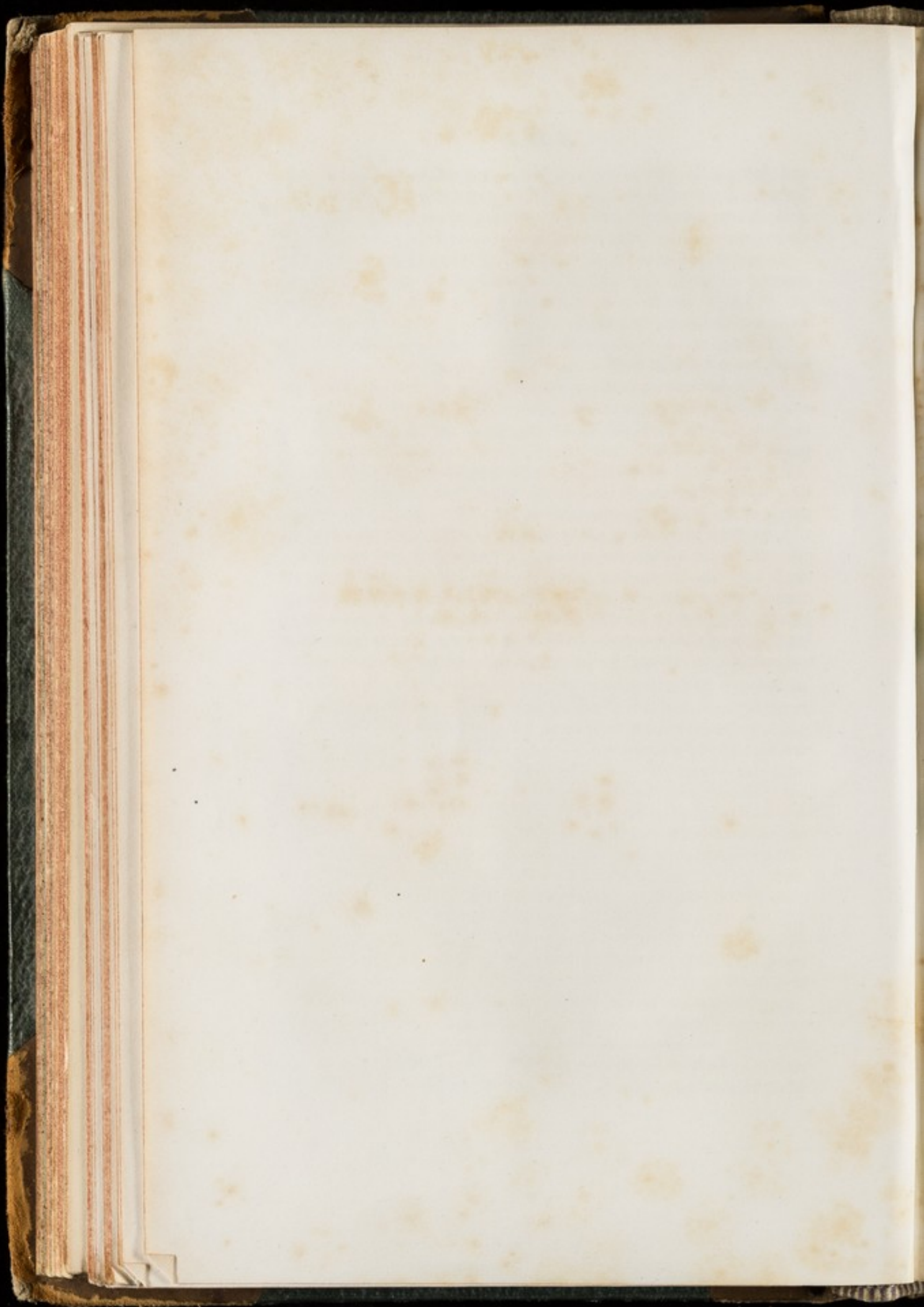
« L'auteur a eu l'honneur de présenter ce livre à l'Académie de  
Médecine, le 15 mai 1840, et de le faire accepter par elle.

CONSTANTINE.

FÉLIX GUENDE, LIBRAIRE-ÉDITEUR, PLACE DU PALAIS.

1840.







**RELATION**  
**MÉDICO-CHIRURGICALE**  
**DE L'EXPÉDITION**  
**DU BOU-THALEB**  
**(PROVINCE DE CONSTANTINE)**

**ET NOTICE**

SUR LE SERVICE CHIRURGICAL DE L'HOPITAL MILITAIRE DE SÉTIF A  
LA SUITE DE CETTE EXPÉDITION, SUR LES CONGÉLATIONS PAR-  
TIELLES, LEUR TRAITEMENT, ETC.

**PAR C. SHRIMPTON, M. D.**

CHIRURGIEN EN CHEF DE L'AMBULANCE ACTIVE DE LA PRO-  
VINCE DE CONSTANTINE, EX-CHIRURGIEN EN CHEF DE  
L'HÔPITAL MILITAIRE DE SÉTIF, CHEVALIER DE  
LA LÉGION-D'HONNEUR.

• Car le Médecin et le Chirurgien ne sont que  
ministres et aides de la nature pour l'aider en ce où  
elle tend commodément. •

(Ambroise PARÉ. Édition de 1628. Des playes d'har-  
quebuses, page 433).

**CONSTANTINE,**  
**FÉLIX GUÉNDE, LIBRAIRE-ÉDITEUR, PLACE DU PALAIS.**

—  
**1846.**



1856

RELATION

MEDICO-CHIRURGICALE

DE L'ARMÉE

DU BOU-TALIE

(PROVINCE DE CONSTANTINE)

PAR C. SHAW

REDACTEUR EN CHEF DE L'ARMÉE MEDICO-CHIRURGICALE DE L'ARMÉE DU BOU-TALIE

PAR C. SHAW

REDACTEUR EN CHEF DE L'ARMÉE MEDICO-CHIRURGICALE DE L'ARMÉE DU BOU-TALIE

CONSTANTINE,  
IMPRIMERIE EL LITHOGRAPHIE DE FÉLIX GUENDE,  
PLACE DU PALAIS.

La relation de l'Armée Medico-Chirurgicale de l'Armée du Bou-Talie, par C. Shaw, est une œuvre importante, qui donne une idée exacte de l'état de l'armée et de la population de la province de Constantine.

CONSTANTINE

FÉLIX GUENDE, LIBRAIRE-ÉDITEUR, PLACE DU PALAIS.

1856



L'opuscule que je présente aujourd'hui au public médical existait depuis longtemps dans mes papiers à l'état d'ébauche. Relégué dans une des stations les plus reculées des possessions françaises en Algérie, à 50 lieues dans l'intérieur des terres et loin de tout mouvement intellectuel et scientifique, je ne songeais point à le publier. Mon retour à Constantine a pu seul amener la détermination à laquelle, non sans hésitation, j'obéis en ce moment. Ici plusieurs de mes amis ont trouvé les faits que j'ai été à même d'observer et les réflexions qu'ils m'ont suggérées dignes de quelque attention; ici, quelques jours après mon arrivée et comme pour



*faire cesser mon indécision, s'est établie une typographie dont l'installation et les ressources rappellent les imprimeries des grandes villes de France. Le sort en est donc jeté; j'abandonne au courant de la publicité, avec toutes ses imperfections et ses défauts, ce petit livre où j'ai déposé des faits observés au milieu des circonstances les plus pénibles de la vie militaire et des idées méditées loin de toute bibliothèque, dans la solitude d'un camp.— Puisse-t-il obtenir l'indulgence de mes confrères.*

Constantine, le 20 Octobre 1846.



# EXPÉDITION

DU

## BOU-THALEB.

DÉCEMBRE 1845.

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Un Marabout de la tribu des Ouled-Tebben, Si-Saad, avait entraîné dans la révolte plusieurs fractions des Ouled-Sultan, et excité des troubles graves parmi les populations du Bou-Thaleb et du Hodna. Il était devenu nécessaire de disperser les contingents qui s'étaient réunis sous son drapeau et de châtier les tribus les plus turbulentes. A cet effet, une colonne de 2,800 hommes, commandée par M. le général Levasseur se dirigea sur le théâtre des événements. L'infanterie composée de troupes des 2<sup>e</sup>, 31<sup>e</sup>, 45<sup>e</sup> et 61<sup>e</sup> de ligne, du 3<sup>e</sup> bataillon d'infanterie légère d'Afrique et des tirailleurs indigènes, quitta Constantine le 9 décembre 1845, avec un détachement du génie de 25 hommes, une batterie de montagne et 150 chevaux du 3<sup>e</sup> chasseurs d'Afrique. Les spahis, au nombre de 80, se mirent en marche trois jours plus tard, le



22. Départ. Le camp est formé de nouveau à Foum-Bou-Hamman, sur le versant sud de Bou-Thaleb, après quatre heures de marche.

23. Séjour. Beau temps.

24. Le camp est transporté à Foum-Bou-Thaleb dans la même direction et à une distance de trois heures de marche seulement. Deux hommes sont blessés au commencement de la nuit auprès de leur feu d'avant-poste. L'un d'eux, n'a qu'un simple séton à la partie interne et inférieure de la cuisse, mais le nommé Fonitaret, fusilier au 43<sup>e</sup> de ligne, a reçu un coup de feu mortel. La balle a pénétré au-dessous de l'angle postérieur et supérieur de l'omoplate gauche, brisé les lames des 3<sup>e</sup> et 4<sup>e</sup> vertèbres dorsales et s'est logée dans le canal rachidien. Paralysie de la sensibilité et du mouvement dans la partie inférieure de la poitrine, les parois abdominales et les extrémités inférieures. Paralysie de la vessie et du rectum. Une incision cruciale divise la masse des muscles qui remplissent la gouttière vertébrale et conduit sur la fracture rachidienne. La balle a dû traverser la moëlle épinière; elle ne peut être extraite.

25. Trois bataillons envoyés dans la montagne en reviennent le soir avec 7 blessés dont un seul est mortellement atteint. C'est un caporal du bataillon turc qui a reçu une balle dans la région lombaire. La plaie est largement débridée, mais



les investigations auxquelles nous la soumettons nous donnent la triste conviction que le projectile est allé se perdre dans la cavité abdominale. Pouls petit, faible, lent, extrémités froides, face grippée. Un organe important a dû être intéressé. M. Bessières, capitaine au bataillon ture, a reçu à la cuisse deux coups de feu qui n'offrent que peu de gravité.

26. Séjour. Beau temps.

27. Le camp est levé. La colonne revient sur ses pas pour contourner le Bou-Thaleb, et après cinq heures de marche, campe à Aïn-Assel. Le blessé qui a reçu une balle dans le canal vertébral et le caporal ture meurent pendant la journée. Il ne nous est pas possible de faire leur autopsie.

28. Départ de la colonne. Évacuation sur Sétif de 30 malades des corps, et 12 de l'ambulance. Nous passons sur le versant nord du Bou-Thaleb, et après avoir marché pendant sept heures campons à Aïn-Rhumel. L'eau est abondante, le bois éloigné.

29. Le camp est transporté à une distance de deux lieues, à Aïn-Cisely, emplacement occupé naguère pacifiquement par un camp de bûcherons français qui y exploitaient pour la garnison de Sétif, de magnifiques mélèzes.

Un goum de 3,000 Arabes attiré par l'appât du pillage s'est joint à notre colonne. Cette masse se porte en avant, mais bientôt rencontrant un parti



ennemi groupé autour d'un drapeau rouge et dont les cavaliers paraissent disposés à se défendre, elle se replie. A peine nos troupes se sont-elles montrées que l'ennemi à son tour prend la fuite. Le goum reprend la charge et enlève le drapeau des insurgés, composé de quatre mouchoirs de coton.

Aucun des nôtres n'est blessé dans cette affaire. La nuit suivante, deux imprudents qui s'étaient revêtus de leur sac de campement pour aller relever les sentinelles, sont pris pour des Arabes et tombent sous les balles de leurs camarades.

Non loin de nous, dans le Djebel-Anoual, existe une riche mine de plomb exploitée grossièrement par les indigènes à l'aide de galeries mal disposées et où les accidents sont fréquents. Ce plomb, dont quelques échantillons ont été jadis examinés à Sétif, paraît n'être pas argentifère et ne mérite pas, par conséquent, les frais d'une exploitation européenne.

Aïn-Cisely est exactement au nord de la gorge qui forme le Foum-Bou-Thaleb, où le camp fut établi le 24.

30. La colonne se met en marche sans sacs et pénètre dans la montagne par des chemins escarpés. Quelques cabanes construites dans la vallée et plusieurs maisons placées au bas d'un ravin sont détruites.

Le goum vide les silos. L'ennemi ne se montre qu'au retour, au bas du ravin où étaient les mai-



sons. Deux fantassins sont blessés. L'un d'eux, a reçu à la partie supérieure du front une balle qui s'est perdue dans la masse encéphalique; l'autre, n'a été atteint que d'une balle morte, à la malléole interne du pied gauche. Rentrée au camp par une pluie battante.

31. Le temps s'est remis au beau. Séjour. Le soldat atteint d'une balle dans le crâne, succombe.

1<sup>er</sup> Janvier. Retour dans la montagne et destruction d'un groupe de maisons au milieu desquelles se trouvait la zaouia de Si-Saad, le chef des révoltés. Ces constructions étaient en très-bonne maçonnerie et occupaient un plateau pittoresque entouré d'arbres fruitiers, etc.

Ce matin, au moment du départ le temps menaçait; mais les nuages se sont dissipés vers midi et un soleil radieux s'est montré.

Quelques rares coups de fusil dans la journée. Au moment où s'exécute le mouvement de retraite, trois fantassins sont atteints de coups de feu: l'un à la joue, séton simple sous-cutané; un second à la jambe, séton à travers les muscles jumeaux et soléaire; chez le troisième, Herbert, grenadier au 61<sup>e</sup>, la balle a pénétré à deux travers de doigt au-dessous de l'épine iliaque postérieure se dirigeant à travers les muscles fessiers, vers la cavité digitale du fémur et n'a pu être extraite.

2. Le camp est levé à neuf heures après que les



soldats ont mangé la soupe. La matinée est belle. Nous nous dirigeons vers le Nord-Est. Une petite pluie tombe au moment où nous entrons dans la montagne et cesse bientôt. Vers une heure la neige commence et rend la marche difficile. Plusieurs mulets du convoi s'abattent. Le camp est formé à cinq heures du soir chez les Ouled-Moessa : l'arrière-garde n'arrive qu'à sept heures. Un vent violent du Nord souffle ; la neige tombe en flocons serrés ; le froid est extrême et engourdit nos soldats qui ont grand peine à planter leurs tentes. Le bois est rare, les feux du bivouac sont maigres et difficilement alimentés. La majeure partie des troupes, malgré la sollicitude et les efforts des chefs est obligée de se passer de soupe et de vivre de biscuit. Pendant la nuit la neige continue avec une abondance excessive. Elle s'accumule autour des tentes, les couvre et éteint les feux.

Trois hommes engourdis par le froid sont conduits à l'ambulance : des pierres chaudes aux pieds, un peu de café chaud et des couvertures de laine les rétablissent promptement.

*Marche sur Sétif. 3.* Le camp a pour ainsi dire disparu sous la neige. A grand peine les hommes parviennent à sortir de leurs tentes. Un grand nombre et particulièrement les jeunes soldats, ou ceux qui, à une époque peu éloignée ont eu à souffrir de la fièvre, sont tellement engourdis qu'ils



ne peuvent que difficilement se maintenir debout. On en conduit dès le matin 15 à l'ambulance. Deux d'entre eux, déjà sous l'imminence de l'asphyxie, ne tardent pas à succomber. Les seuls moyens dont nous puissions disposer contre ces accidents imprévus sont bornés. Nous prescrivons quelques gouttes d'éther sulfurique ou un peu de vin de cannelle à l'intérieur. Les malades sont déshabillés, enveloppés dans des couvertures de laine et soumis à des frictions sèches. Nous avons songé à les faire frotter avec de la neige, moyen vulgairement usité contre les congélations dans tous les pays froids, et que Georges Gmelin a vu employer avec succès en Sibérie, et le capitaine Ross chez les Esquimaux. Mais, en y réfléchissant, il nous sembla que la neige ne pouvait être utile, 1<sup>o</sup> dans le cas où l'économie toute entière était atteinte, qu'à la condition d'élever peu-à-peu, après son emploi, la température des individus; 2<sup>o</sup> dans les cas de congélations partielles que sous la même condition ou au moins dans les cas où l'état général permettait d'espérer une réaction. Or d'une part, nous manquions de feu, d'eau tiède, de boissons chaudes et de tous les moyens nécessaires pour rechauffer graduellement les militaires qui nous avaient été amenés; et d'autre part, eussions nous eu ces moyens, que la levée du camp nous eût empêché de les mettre en œuvre. Des frictions avec de la



neige n'auraient donc fait qu'abaisser la température de nos malades et déterminer une dépression plus profonde de leurs forces.

Le camp est levé à sept heures du matin et sans que le soldat ait pu manger la soupe. La souffrance ressentie par tous, entraîne un certain désordre. La colonne a de la peine à commencer son mouvement ; elle marche péniblement, et au bout de dix minutes s'arrête. Les heures s'écoulent, le soir arrive, même immobilité. Les troupes sont debout et silencieuses, le sac au dos, sous la neige qui tourbillonne, exposées à un vent violent du Nord, et il y a plus de 24 heures qu'elles n'ont pas mangé ! Nous n'apprenons que très-tard la cause de ce temps d'arrêt désastreux. Le convoi qui marchait en tête a rencontré un défilé étroit et rapide par où il ne s'écoule que lentement. Nous même enfin qui avions laissé l'ambulance prendre les devants et qui étions resté en arrière avec 2 malades que leur état empêchait de suivre, nous arrivons au défilé. Il est 4 heures du soir, le temps est sombre, le jour baisse. Le sentier par où il nous faut faire passer le mulet chargé des deux litières qui portent nos malades a 1 mètre 50 centimètres de largeur à peine. Il est raide et glissant, couvert de neige battue et cotoie un précipice où plusieurs des bêtes de somme du convoi ont été entraînées. Après ce passage dangereux la descente est encore très-



difficile. Elle s'effectue sur une pente rocheuse entrecoupée de ressauts, à tout instant interrompue, rapide, où la neige cache la véritable voie et expose à chaque pas à des chûtes. Là, ont été abandonnés tous les vivres (1), une grande partie du matériel de campement, des bagages, etc. En présence de ces obstacles, nous renonçons à emmener nos deux malades en litière. L'un d'eux, indigène, qui est convalescent d'une fièvre pernicieuse, est déposé sous la tente du scheik Mèçaoud; le second, Herbert, blessé le 1<sup>er</sup> janvier, est placé sur un cheval d'officier qu'un infirmier tient en main. Ces dispositions prises nous traversons le défilé et commençons la descente. Ici la mort a frappé déjà et frappe encore sous nos yeux un grand nombre de victimes. La route est jonchée de cadavres, tombés à droite et à gauche du chemin, de soldats engourdis qui ne peuvent se soutenir, et leurs camarades qui passent semblent ne pas même les apercevoir! Pas un mot de consolation ou d'espoir pour ces malheureux, que nous laissons derrière nous, et qui ne doivent plus revoir les champs de la patrie! C'est que chacun souffre, et suffit à peine à sa propre misère, c'est qu'il faut avancer ou mourir. D'ailleurs, ceux que le froid a saisis et empêche d'avancer refusent

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(1) Après l'abandon des vivres, l'arrière-garde put profiter des caisses de biscuit pour faire du feu et se procurer du café chaud. Elle fut sous ce rapport moins malheureuse que le reste de la division.



tout secours. En vain nous cherchons à en encourager quelques-uns, nous tentons de les relever et de les mettre en mouvement. Les uns qui ont le sentiment d'une fin prochaine nous repoussent brusquement; d'autres, qui ne souffrent pas et qui s'endorment doucement dans la mort, nous supplient de les laisser tranquilles, et nous disent qu'après quelques minutes de repos ils se remettront en route. Nous chargeons sur des cacolets le plus de ces hommes qu'il nous est possible et nous les y faisons attacher solidement. Chez plusieurs qui marchent encore et se plaignent seulement d'une difficulté dans la progression, se remarquent cependant déjà, les signes avant-coureurs d'une mort prochaine : engourdissement général, douleur dans les membres et aux aines, contraction musculaire faible et incertaine, facies rouge, tuméfié, lèvres bleuâtres, yeux saillants, lividité de la peau, gonflement des mains, pouls petit et faible, respiration lente. Tous ces symptômes s'aggravent rapidement; les yeux prennent une expression d'égarement; la marche est indécise; l'homme vacille et tombe enfin pour ne plus se relever. La peau des mains se fendille alors et laisse souvent couler 60 à 100 grammes de sang.

Quoique le malade conserve sa connaissance il paraît en proie à l'ivresse. Son corps est comme une masse inerte qui retombe aussitôt qu'on la relève.



Pendant que nous nous occupions à ramasser les malheureux engourdis par le froid, notre blessé, Herbert, a filé en avant. La nuit est close, la neige tombe toujours; nous avons perdu toute trace de la colonne. Nos malades ont succombé. Deux hommes sont avec nous: l'un appartient au train, l'autre aux ouvriers d'administration. Il nous eût été impossible de faire un pas de plus si le chien de ce dernier ne nous avait, de cadavre en cadavre, indiqué la route suivie par nos troupes. Nous marchons avec ardeur, et trois heures après (environ 9 heures du soir) nous rejoignons une quarantaine d'hommes et deux cantinières du 43<sup>e</sup> de ligne, arrêtés avec du bagage sur le bord d'un ravin. Il était urgent de prendre des dispositions pour passer la nuit. Je fais à la hâte former un carré avec les cantines et les ballots. Dans l'intérieur sont étendues une partie des tentes que nous possédions, et qui, durcies par la gelée et dépourvues de piquets et de montants n'auraient pu être déployées. Des fusils formés en faisceaux supportent une autre tente qui nous garantit assez bien contre les injures de l'air, puis nous nous couchons et nous nous tenons serrés les uns contre les autres. Les chevaux et les mulets sont attachés à des cordes en dehors de notre enceinte. Pendant que nous organisons notre coucher, un de nos compagnons s'écarte de quelques pas et se fait sauter



la cervelle. La nuit se passe sans sommeil dans un engourdissement douloureux.

4. Notre petite troupe se lève avant le jour. Je fais distribuer un peu d'eau-de-vie et du pain trouvés dans les cantines, et tandis qu'on charge les mulets, je gagne le haut d'un mamelon d'où les yeux découvrent un horizon assez étendu. Après quelques minutes de recherche j'aperçois, non sans un vif sentiment de plaisir, la colonne à environ quatre lieues de nous. Il est évident que pendant la tourmente de la veille, les troupes se sont morcelées et ont suivi par petits groupes une infinité de directions. L'arrière-garde est sur notre gauche, le centre de la colonne sur notre droite, et ça et là sont éparpillées à des distances plus ou moins grandes, une foule de petites troupes qui, comme nous, ont perdu la voie et se sont égarées. En revenant donner cette bonne nouvelle à mes compagnons d'infortune, je rencontre une hutte abandonnée, à la porte de laquelle sont attachés deux chevaux que nous rendîmes plus tard à leurs propriétaires, et qui nous furent d'un grand secours.

Nous nous remettons en route. Le soleil se dégage lentement des vapeurs de l'horizon, puis, brillant et glorieux il s'élance dans l'espace. Ses rayons font scintiller de mille feux, les surfaces blanchies qui nous entourent. La marche cependant est difficile. Une neige épaisse de quarante



centimètres dans la plaine et beaucoup plus profonde encore dans les parties accidentées, couvre le sol et rend la progression lente et pénible.

Au bout de deux heures, nous atteignons une tente d'ambulance abandonnée. Sur 40 hommes qui y ont passé la nuit, 6 ont succombé. J'organise à l'aide du matériel qui s'y trouve, six paires de cacolets, où sont chargés les 12 hommes les plus malades. Ni mes exhortations, ni mes conseils ne peuvent décider les autres à se joindre à nous. Le scheik Meçaoud qui parcourt en tous sens le pays que la colonne a traversé, pour rallier les trainards et remettre les hommes égarés sur la route de Sétif, nous indique la direction à suivre. Avant le départ, un peu de pain et d'eau-de-vie provenant des cantines de M. le capitaine de Prémonville, est mis généreusement à notre disposition, et distribué avec une rigoureuse équité entre tous.

De temps en temps nous passons à côté de malheureux étendus sur la neige et que le manque de moyens de transport nous empêche d'emmener. Nous leur administrons quelques gouttes d'éther (1), seul médicament à notre disposition, et nous les laissons en leur faisant espérer que les Arabes amis

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(1) Sous l'influence de ce médicament les malades éprouvent une réaction évidente, mais que nous sommes dans l'impossibilité de maintenir et qui s'éteint bientôt.



qui parcourent le terrain, ne tarderont pas à les recueillir. Cet abandon cependant nous paraît inhumain. La voix du devoir plus impérieuse encore et plus solennelle au milieu des désastres peut seule nous y décider. Elle nous dit de résister à une pitié stérile. Avant de consoler les derniers moments d'hommes que rien n'aurait rappelé à la vie, nous avons à conduire au port ceux antérieurement recueillis, et dont l'existence pouvait encore être sauvée.

Nous ne tardons pas à marcher sur les pistes de la colonne qui a suivi évidemment trois lignes à-peu-près parallèles.

Le temps est beau. Le froid sec et piquant qu'apporte le vent du Nord et que combattent en partie les rayons du soleil, serait supporté avec plaisir par des hommes dont l'estomac aurait été suffisamment lesté et qui auraient eu moins à souffrir que les nôtres. Nous cheminons douze heures durant dans des terres à labour, détrempées par la fonte des neiges où les pieds contractent une froidure douloureuse. Le jour décline, le vent du Nord redouble d'âpreté. De distance en distance nous recueillons encore quelques hommes isolés. Enfin l'obscurité règne de nouveau, mais Sétif est là ! Sétif le lieu de refuge et de repos, où des collègues bienveillants nous accueilleront, et malgré l'épuisement de nos forces et le nuage que la défaillance



fait de temps à autre passer sur nos yeux, nous avons la conscience que nous y arriverons. A neuf heures en effet nous abordons ce Hâvre-de-Salut. On me descend de cheval et les soins empressés dont mon digne confrère M. Moreau m'entoure, m'ont bientôt rappelé à moi-même.

Aucun des militaires faisant partie du détachement qui me suivait depuis la veille n'a été abandonné, aucun n'a eu à souffrir de congélations même circonscrites. Ce résultat doit surtout être attribué aux conditions dans lesquelles nous avons passé la nuit précédente, conditions bien moins défavorables que celles où s'était trouvée la majorité de la division et aussi aux quelques bouchées de pain et au peu d'eau-de-vie que nous avons pu distribuer à deux reprises au commencement de la journée. Si les troupes qui nous précédaient et celles qui nous suivaient perdirent un si grand nombre d'hommes et eurent à souffrir si généralement des congélations, c'est sans doute parce que privées d'abri pendant une longue et cruelle nuit; parce que complètement à jeûn depuis longtemps, elles eurent à supporter une dépression plus profonde des forces et ne purent par aucun moyen provoquer la réaction.

Ces troupes parties de Constantine si brillantes et si résolues, rentrèrent au camp de Sétif harassées, mourantes, en partie désarmées, par petits



groupes, depuis le 4 à trois heures de l'après-midi jusqu'au 11. L'émotion qu'un pareil spectacle y causa fut profonde. Certes il avait fallu à ces régiments disciplinés et braves, bien des souffrances pour qu'ils se débandassent ainsi. Si à un certain instant, l'esprit de corps qui groupe les hommes autour de leurs chefs et les unit entre eux, avait été oublié, c'est qu'alors la mort planait sur tous et à tous paraissait inévitable et prochaine. D'ailleurs le point d'honneur militaire n'était point ici engagé, et les mêmes soldats qui seraient tombés fièrement et sans reculer d'un pas sous le feu de l'ennemi, n'étaient tenus par aucun principe à attendre la mort lente et affreuse que leur apportaient les éléments.

Dans ces circonstances la garnison et la population de Sétif furent admirables de dévouement. Elles organisèrent d'un commun accord les secours les mieux entendus. Un grand nombre d'individus avec des voitures, des chevaux et des mulets se mirent à la recherche des militaires qui n'avaient pu rejoindre et qui composaient la presque totalité de la colonne. Des patrouilles de chasseurs parcoururent le pays dans la direction que nous avions suivie. Les hommes les moins malades et ceux qui furent ramassés à une distance peu éloignée furent, le jour même, ramenés au camp. C'était à qui se priverait pour leur porter secours. Les soldats du



19<sup>e</sup> léger leur cédèrent couchette, couverture et, ce qui était plus méritoire encore, la soupe elle-même. Les colons mirent à leur disposition leurs maisons où de grands feux avaient été allumés et des aliments préparés. L'hôpital distribuait des bouillons à tous ceux qui se présentaient. Les militaires qui furent rencontrés à des distances trop grandes ou que leur état ne permettait pas de ramener immédiatement, furent déposés dans les douars et confiés aux Arabes qui, sauf de rares exceptions, se montrèrent peu humains.

5. M. le capitaine Champanhet, chef du génie, part à sept heures du matin avec sept voitures, quinze sapeurs, du bois, des vivres et des couvertures. Il réunit chemin faisant, un grand nombre de malades, mais ne voulant ni les emmener dans les recherches qu'il doit pousser à plusieurs lieues, ni les reconduire de suite au camp, ce qui lui eût fait perdre un temps précieux, il leur donne des vivres, des couvertures et leur fait faire un grand feu de bivouac où ils attendront son retour. Il s'avance ensuite jusqu'à Aïn-Maleloul et y recueille ceux des nôtres que leur faiblesse ou des congélations partielles avaient forcé de s'y arrêter, après quoi il rétrograde et vient reprendre les malades qu'il avait réunis dans la journée. A peu de distance de Sétif ce petit convoi est surpris par la nuit, et, la neige qui recommence à tomber ne lui permet-



tant pas de reconnaître sa route, il est obligé de s'arrêter et d'attendre jusqu'au lendemain. Mais les hommes sont sur des voitures garnies de paille et ont eu du café chaud; de bonnes couvertures les enveloppent et les réchauffent, et cette nuit, bien différente pour eux de celles qui ont précédé, se passe sans de nouveaux accidents.

La narration qui précède était nécessaire pour expliquer les circonstances où, comme chirurgien, je me suis trouvé placé et l'origine des faits qui se sont offerts à mon observation. Je n'ai point eu à parler des opérations militaires ni à les apprécier, telle ne pouvait être ma tâche. Officier de santé avant tout, je n'ai dû songer, alors comme toujours, qu'aux souffrances et aux maladies de mes semblables. Je n'ai pas d'ailleurs la prétention d'avoir présenté une histoire détaillée de notre désastre. J'ai voulu seulement, par ce qui m'a été personnel, en donner une idée. Cette histoire détaillée un autre serait-il en position de la faire? J'en doute. Dans ce tableau immense où les plans étaient innombrables, les groupes et les individus disséminés à l'infini, nul n'a pu tout juger, nul n'a pu voir toutes les souffrances, ni compter tous les dévouements.



*Hôpital militaire de Sétif.* On se rend facilement compte de la perturbation qu'un pareil événement dût jeter dans l'hôpital de Sétif. Cet établissement encore inachevé, et qui, dans son état actuel, ne peut recevoir commodément que 200 malades, vit, dans la seule nuit du 4 au 5 janvier, son chiffre s'élever de 180 à 267, puis grossir successivement jusqu'à 546. Aussi fut-on dans l'obligation de lui annexer tout d'abord, une partie de la caserne de l'Horloge, qui fut affectée exclusivement au service des congelés. Ce local le seul disponible, était dans les conditions les plus fâcheuses, ouvert à tous les vents, sans plafonds, et d'ailleurs trop peu spacieux pour le nombre de malades qu'il s'agissait de recevoir. Les embarras furent grands. Le matériel manquait; les infirmiers étaient peu nombreux; le personnel des officiers de santé, suffisant pour 200 malades presque tous fiévreux, était hors de toute proportion avec les nouveaux besoins qui venaient de surgir. Tous les malades provenant de l'expédition réclamaient de grands soins, des opérations plus ou moins majeures, des pansements longs et minutieux. Et nous n'avions que six sous-aides pour satisfaire à un pareil service! Néanmoins, ces difficultés furent pour la plupart vaincues. L'élan avec lequel tous les corps nous vinrent en aide mit bientôt à notre disposition des ressources inespérées. L'administration fit



établir des paillasses pour tous nos malades ; des matelas de campement furent donnés aux hommes les plus gravement atteints ; l'infanterie nous envoya des infirmiers , peu au fait , il est vrai , des soins à donner à des blessés , mais que leur zèle , leur bon vouloir et leur charité active élevèrent bientôt à la hauteur de leurs fonctions ; les officiers de santé des corps s'empressèrent de partager nos fatigues et nos travaux. M. le général Levasseur enfin par sa sollicitude pour les malheureux que nous avions à traiter , par les visites qu'il leur fit , les bonnes paroles et les encouragements qu'il leur donna , releva tous les courages et toutes les espérances.

Nous devons insister d'une manière toute spéciale sur le service que nous tirâmes des infirmiers pris dans les régiments : ces hommes éprouvés déjà antérieurement par des expéditions où ils avaient plus ou moins souffert , comprenaient toute l'étendue des maux que leurs camarades avaient eu à supporter. Aussi ne les soignaient-ils pas parce que tel était leur service , avec cette indifférence que la routine et l'habitude des hôpitaux donnent si souvent aux infirmiers permanents. Ils étaient bons et soigneux , et je dirai presque tendres comme des frères pour ces infortunés , qui , de leur côté , se sentant aimés , s'abandonnaient avec une douce quiétude , avec une absolue confiance



aux soins qu'on prenait d'eux. Ils accomplissaient à la lettre les instructions qu'ils recevaient et ne se livrèrent jamais, nous sommes en mesure de l'assurer, à ce honteux trafic d'aliments et de boissons qui fait mourir plus de malades que les maladies elles-mêmes et que la surveillance la plus active n'a pu, à notre connaissance, arrêter dans aucun hôpital. C'est qu'encore une fois ils n'avaient été poussés dans nos salles ni par le désir d'échapper à la vie pénible du régiment et aux chances de la guerre, ni par la pensée du bénéfice pécuniaire qui pouvait en résulter pour eux, mais uniquement par des sentiments d'humanité.

Une seule difficulté était restée insurmontable. On n'avait pu nous fournir de local suffisamment vaste. Les salles regorgaient de malades; les paillasses y avaient été rapprochées jusqu'au contact et à peine entre les rangées qu'elles formaient y avait-il assez de place pour poser les pieds. Cet entassement de malades atteints généralement de congélations étendues et devant donner lieu à des plaies vastes et fétides causait de justes alarmes. La pourriture d'hôpital s'était plus d'une fois montrée dans des conditions moins défavorables. Aussi, dès le principe, prîmes nous toutes les mesures hygiéniques susceptibles de paralyser les effets de l'encombrement. Chaque fois que le temps le permettait les malades étaient, dès le matin, envoyés dans la



cour. Ceux qui ne pouvaient marcher y étaient transportés sur des brancards garnis de paillasses. Les hommes dont l'état aurait rendu tout déplacement fâcheux étaient seuls laissés dans les salles qui, pendant ce temps, étaient nettoyées à fond, soumises à des fumigations chlorurées, puis ouvertes à l'air extérieur et aux rayons du soleil. Ces mesures, utiles comme hygiène générale, contribuèrent puissamment aussi, nous en sommes convaincus, au succès dont furent couronnées la presque totalité de nos opérations.

Quelques jours après arrivèrent de Constantine où la nouvelle de notre désastre et de notre dénuement était parvenue, matériel et personnel. Alors le service put reprendre les habitudes de régularité dont il était momentanément sorti. Il fut ainsi réparti : M. Moreau, médecin en chef, excellent confrère dont le zèle égale le savoir, voulut bien se charger d'un certain nombre de congelés qui lui donnèrent lieu de pratiquer, avec succès, plusieurs opérations. M. Ladureau, chirurgien aide-major au 19<sup>e</sup> léger, chargé antérieurement des blessés de l'hôpital, reçut dans ses salles tous ceux de nos hommes qui purent y trouver place, et fit également plusieurs opérations heureuses. Je me chargeai de mon côté du local annexe spécialement destiné au service des congelés.



Avant de présenter sur le froid et ses effets les idées générales que l'étude des faits nous a suggérées et les histoires particulières intéressantes que nous avons pu recueillir, nous croyons devoir donner un résumé statistique qui fera connaître la situation sanitaire de notre colonne après sa rentrée à Sétif. Les troupes avaient un effectif de 2,800 hommes : 208 périrent pendant la marche et sous l'action immédiate du froid, 2,600 rentrèrent au camp. Parmi ces derniers, 250 à-peu-près peuvent être considérés comme ayant échappé complètement à l'influence fâcheuse de la neige ; 1,800 atteints de congélation superficielle et qui ne purent, faute de place, être admis à l'hôpital guérèrent tous sans accident après un traitement à la caserne dont la durée, variable pour chacun, peut être estimée en moyenne à 35 jours. Sur 552 qui entrèrent à l'hôpital 55 furent soumis à des opérations et fournirent 3 morts : 477 furent traités par des moyens purement médicaux et donnèrent 19 morts.

Il résulte de ces chiffres que le froid fut supporté d'une manière très-inégale par les hommes qui y furent soumis. Les uns moururent tandis que d'autres ne furent pas même incommodés ; ceux-ci présentèrent des congélations graves et profondes, ceux-là de simples engelures. C'est qu'en effet l'action d'un agent, quel qu'il soit, ne dépend pas



seulement de sa nature et de sa puissance. Elle est en grande partie déterminée par la vitalité des organes, par le mode d'être et de sentir des individus. Et c'est pour cela aussi que les causes morbides sont si difficiles à apprécier, les agents médicaux si difficiles à appliquer. Dans le cas actuel deux causes rendirent les effets du froid si dissimilables entre eux : 1<sup>o</sup> la température ne fut pas également rigoureuse sur tous les points où nos troupes s'étaient disséminées; 2<sup>o</sup> les hommes sur lesquels elle s'exerça étaient dans des conditions très-différentes.

Dans la nuit du 2 au 3 le campement avait offert des conditions très-analogues pour tous et, sauf les différences que des vêtements plus ou moins chauds, plus ou moins neufs ou usés pouvaient introduire, le froid avait frappé toute la colonne avec une même intensité. Aussi les accidents qui survinrent alors durent-ils être presque exclusivement attribués à des prédispositions individuelles et à une faiblesse particulière de la constitution. Mais dans la nuit du 3 au 4 il n'en fut plus de même; les conditions cessèrent d'être comparables. Les uns avaient campé dans la plaine et avaient pu se grouper autour de feux sombres d'où s'élevait, il est vrai, plus de fumée que de flammes; un petit nombre, comme cela m'était arrivé à moi-même, s'était tant bien que mal improvisé des



abris. Il n'est nul besoin de dire que ceux-là furent en général moins refroidis que les hommes perdus sur des mamelons élevés que le vent du Nord balayait avec violence et durent être moins maltraités. Cependant nous constatâmes que les congélations et la mort furent bien moins déterminées par cette différence de trois ou quatre degrés dans la somme du froid que par les circonstances propres aux individus.

Les militaires en très-grand nombre que nous avons interrogés tant parmi ceux qui revinrent à Sétif que parmi ceux qui succombèrent le long de la route, nous ont mis à même d'apprécier les conditions qui rendent surtout le froid fâcheux et celles qui rendent aptes à lui résister.

Les maladies antérieures et particulièrement les fièvres intermittentes rebelles, constituent la prédisposition la plus manifeste à subir l'action du froid. Sur soixante et quelques hommes mourants auxquels j'ai parlé dans les journées du 3 et du 4, un tiers était soumis depuis plusieurs mois à des fièvres quotidiennes et tierces qui reparaissaient tous les dix, quinze ou vingt jours; plusieurs étaient guéris depuis peu de temps de diarrhée ou de dysenterie et quelques-uns étaient encore en proie à ces affections.

L'exemple le plus frappant que j'aie eu sous les yeux de la prédisposition constituée par des fièvres



antérieures est celui d'un muletier arabe nommé Mohammed qui, en proie depuis dix-huit mois à des accès dont le type variait, m'avait plusieurs fois déjà demandé du sulfate de quinine. Dans les intervalles où la fièvre l'abandonnait, cet homme avait le teint jaunâtre des vieux fébricitants. Ses muqueuses étaient profondément décolorées; son pouls, petit et dépressible, avait de l'accélération. En un mot il y avait chez lui appauvrissement marqué du sang. Il allait cependant; et, à l'aide des secours de toute espèce qu'il trouvait à l'ambulance, se serait probablement débarrassé de la fièvre et aurait repris la santé. Dans la journée du 2 Janvier après avoir supporté la neige pendant quelques heures il tomba dans un état presque algide. Une tente arabe le recueillit et on vint nous prier de le voir. Il avait la face grippée, les yeux enfoncés, la voix éteinte, la peau collée aux muscles, la langue froide. Le pouls était filiforme, la respiration rare, etc. Il fut le premier à nous dire que son état n'était pas occasionné par la fièvre mais par le froid. Aussitôt nous le fîmes déshabiller et envelopper de quelques burnous fins et secs qui furent mis à notre disposition, puis furent employés des frictions sèches sur les membres et du café chaud à l'intérieur. Deux heures après nous le revîmes; il dormait, sa peau était chaude, son pouls s'était relevé. Nous ne pûmes le visiter le lendemain avant le départ



de la colonne mais nous apprîmes qu'il allait bien et pouvait se mettre en marche. Quelques heures plus tard nous trouvâmes son cadavre sur la route.

Parmi les dysentériques qui succombèrent à des accidents de congélation je choisirai l'exemple suivant. Il montre que des secours immédiats, qui, suivant toute apparence, auraient réussi à rendre la santé à un sujet exempt de maladie antérieure, furent de nul effet sur une constitution déjà ébranlée.

S....., soldat au 43<sup>e</sup> de ligne, atteint depuis le 30 décembre d'une dysenterie qui provoquait dans les vingt-quatre heures cinq ou six selles sanguines avec tenesme et coliques, avait continué son service sans se plaindre. Dans la nuit du 2 au 3 Janvier il est conduit à l'ambulance dans un état d'engourdissement général voisin de l'asphyxie. Quelques gouttes d'éther sulfurique lui sont administrées, on l'enveloppe dans une couverture de laine neuve et bientôt après il prend du café chaud. La réaction ne tarde pas à s'opérer, et le lendemain matin S..... part avec les autres malades dans un état très-satisfaisant ne se plaignant que d'un peu d'engourdissement dans les pieds et les jambes. Nous le revîmes deux jours après à Sétif. Il nous apprit qu'il avait moins souffert que la majorité des troupes; qu'établi sur un cacolet et enveloppé jusqu'au cou dans une large couverture il n'avait été que peu impressionné par le froid. Les pieds



et les jambes seulement avaient conservé leur engourdissement et les deux bras étaient devenus difficiles à mouvoir. Le facies du sujet n'indiquait pas d'altération profonde et son récit nous aurait complètement rassuré si nous n'avions examiné de nos yeux l'état de ses membres. Voici ce que nous constatâmes ; les deux pieds sont tuméfiés et rouges, leurs orteils, couverts de phlyctènes, ont une nuance livide. Les deux avant-bras sont étendus sur les bras ; les muscles des deux côtés sont indolores à la pression, flasques et ne se contractent plus. Le poulx a d'ailleurs un peu de lenteur et de faiblesse, la respiration est à seize par minute, la peau a une température presque normale. Il ressortit pour nous de cet examen la conviction que l'atteinte portée dans la nuit du 3 au 4 Janvier, par le froid, à la constitution de S..... avait eu plus de gravité qu'il n'était possible de le supposer ; que la médication employée sur l'heure et qui avait ranimé la circulation et l'expansion colorique n'avait eu qu'une action incomplète ; que pendant la marche sur Sétif (journées du 3 et du 4), bien que le froid ait été ressenti à un degré très-faible et tel que sur une organisation non affaiblie il n'aurait eu nul inconvénient, la situation du sujet s'était aggravée ; enfin que nous devions nous attendre à des accidents consécutifs graves.

Cette prévision ne tarda pas à se réaliser, le



lendemain 6 Janvier, des douleurs violentes survinrent aux extrémités inférieures et dans les deux bras; ces derniers toujours sans mouvement, conservèrent leur volume et leur coloration normale; les pieds se tuméfièrent outre mesure et devinrent d'un rouge pourpre; sous les phlyctènes des orteils apparurent des escharres livides; une fièvre obscure se montra et s'éteignit bientôt après.

Dans les jours qui suivirent, malgré l'administration de l'opium que l'état général indiquait doublement, la dysenterie fit des progrès: les selles furent plus fréquentes et devinrent involontaires. La gangrène, de son côté, se montra de plus en plus envahissante. Les pieds s'étaient complètement sphacelés; la chute de quelques escharres avait mis à nu toutes les parties molles qui entrent dans leur composition et qui, à part les tendons, formaient un détritüs infect; la lividité de la peau montait chaque jour plus haut et dépassait déjà les malléoles de quinze centimètres. Le 17 Janvier l'anéantissement des forces et l'altération profonde des traits indiquent une mort prochaine. Cependant le soir se montre un symptôme auquel, vu l'état du malade, nous ne pouvions guère nous attendre. Il y a un opisthotonos très prononcé. Nous avons aussitôt recours à l'opium à hautes doses tant par la bouche qu'en lavements. 18 Janvier. Le trismus s'est joint à l'opisthotonos, l'opium à hautes doses



est continué mais les phénomènes tétaniques persévèrent jusqu'à la mort qui a lieu le 20 Janvier à trois heures de l'après-midi.

Par une coïncidence inexplicable qui doit tenir à une influence générale et qu'on observe assez souvent dans les hôpitaux, le tétanos se montra le lendemain 21 Janvier, chez un autre congelé qui était atteint comme S..... d'une gangrène étendue et qui, comme lui, succomba. Son observation ne serait guère que la reproduction de celle qu'on vient de lire; aussi ne la présenterons nous pas.

*Autopsie vingt-quatre heures après la mort.*

Sujet profondément amaigri. Les membres inférieurs n'ont pu être disséqués.

*Crâne.* Dure-mère naturelle. Sinus vides. La grande cavité arachnoïdienne contient une assez grande quantité de sérosité citrine qui occupe surtout la base du crâne. Le liquide céphalo-rachidien de Magendie a complètement disparu. Surface cérébrale pâle. Le centre ovale de Vieussens est médiocrement sablé et ses sablures sont formées par un sang rosâtre et appauvri. Le reste du cerveau est sain.

La moëlle épinière et ses enveloppes paraissent tout-à-fait naturelles.

*Cavité thoracique.* Cœur sain. Poumons engorgés à leur partie postérieure; tubercules miliaires assez nombreux, muqueuse bronchique rouge.



*Cavité abdominale.* Foie un peu trop volumineux, mou, friable. Son tissu est presque uniformément rouge terne. La muqueuse de l'estomac est fortement plissée, et le bord supérieur de ses plies est pointillé en rouge. Celle des intestins grêles est saine. Celle des gros intestins est parsemée d'ulcérations assez petites, arrondies, profondes, qui sont d'autant plus nombreuses et serrées qu'on les examine plus bas. Les reins sont mous; la muqueuse vesicale finement injectée.

Cette observation qu'on trouvera peut-être encombrée de détails m'a paru trop intéressante pour être exposée en raccourci. Le mode d'invasion des accidents, leur marche, leur terminaison par le tétanos, la nature des lésions trouvées à l'autopsie font naître les réflexions en foule. Je me bornerai, pour le moment, à faire remarquer que ni la rigueur de la saison ni la dépression profonde et directe subie par les centres nerveux n'ont pu empêcher le développement du tétanos.

Après les maladies, la constitution lymphathique, les excès alcooliques, la privation d'aliments aggravent certainement d'une manière notable l'influence fâcheuse du froid. La remarque avait déjà été faite après la campagne de Russie, que les régiments hollandais composés de soldats familiarisés au froid mais lymphathiques avaient plus souffert que les légions recrutées dans le midi de la France d'hommes



bilieux et bruns. Nous avons été à même de constater la justesse de cette observation. Seulement, en Russie comme dans les neiges du Bou-Thaleb, ce n'est pas uniquement à cause de leur plus grande impressionnabilité au froid que les sujets lymphathiques ont particulièrement été décimés, c'est aussi parce qu'ils ne supportent pas la privation d'aliments. Leurs chairs molles et blanches veulent des réparations continuelles; leur système nerveux, dépressible et sans ressort, exige, sous peine de défaillance, une somme donnée de stimulation. On sait que la sobriété de l'homme du midi serait mortelle à l'habitant des zones froides et, vice-versâ, que la nourriture âcre et stimulente et les excès alcooliques de celui-ci, tueraient rapidement le premier. Ce n'était pas sans raison que Ross au moment d'entreprendre un voyage dans les mers polaires avec un équipage composé d'hommes du Nord, c'est-à-dire généralement lymphathiques, avait tenu à avoir de gros mangeurs.

Dire au reste que la privation d'aliments a été très-particulièrement fâcheuse aux sujets lymphathiques, ce n'est pas avancer qu'elle ait été supportée sans dommages par les constitutions nerveuse, sanguine et bilieuse. Nous sommes convaincus du contraire. Parmi les malheureux qui succombèrent et ceux qui furent atteints de congélations partielles



graves, nous en avons remarqué un certain nombre appartenant à ces divers tempéraments, et ce qui prouve que l'abstinence prolongée aggrava beaucoup chez eux l'influence du froid, c'est que les officiers dont le sort durant les journées des 2, 3 et 4 janvier ne différa guère du leur qu'en cela qu'ils ne manquèrent pas complètement d'aliments et d'eau-de-vie, ne comptèrent pas une seule victime.

Nous avons signalé la stimulation avantageuse imprimée par des doses modérées d'eau-de-vie à un grand nombre d'individus qui lui durent probablement l'existence, il nous reste à faire connaître le résultat de l'abus de l'alcool. Les effets des boissons spiritueuses sur l'homme sont bien connus. En petite quantité ces boissons le stimulent; elles accélèrent la circulation, augmentent la somme de chaleur, rendent plus vive et plus prompte l'action intellectuelle. Prises avec excès elles déterminent une sorte d'intoxication, promptement dissipée il est vrai, dans la très-grande majorité du cas, mais qui, dans certaines circonstances, peut devenir mortelle. Les expériences de M. Magendie en établissant que l'alcool ingéré passe avec une très-grande rapidité dans le torrent circulatoire, ont parfaitement expliqué son mode d'action. Entraîné par le sang, ce liquide exerce, molécule à molécule, son influence sur tout l'ensemble du système ner-



veux, d'où, s'il est assez abondant, intoxication directe. Mais en même temps il est présenté à tous les organes sécréteurs, aux glandes, à la peau, d'où séparation incessante et rejet rapide en dehors de l'économie. Toute condition susceptible de déprimer concurremment le système nerveux, doit donc avoir pour résultat de rendre l'intoxication alcoolique plus profonde et plus grave; toute condition susceptible de diminuer ou d'enrayer les sécrétions doit donc aussi avoir pour résultat de faire séjourner l'alcool dans les tissus et de rendre l'intoxication alcoolique plus lente à se dissiper et peut être même mortelle. Or le froid jouit à un haut degré, de la double faculté d'hypotheniser le système nerveux et, en enchaînant l'influx nerveux, de suspendre les sécrétions.

Nous n'ignorons pas que les abus alcooliques entraînent assez fréquemment la mort en provoquant sur les viscères importants, tels que le cerveau et les poumons, des congestions rapides et considérables; mais bien que nous n'ayons fait aucune autopsie et que nous ne puissions, dans cette question juger que d'après des vues théoriques, il nous semble que c'est bien moins par le fait des congestions viscérales, que directement par les effets combinés du froid et de l'alcool sur le système nerveux, que sont morts les individus qui au commencement de la journée du 3 janvier,



profitant de l'abandon du convoi, abusèrent de l'eau-de-vie qui s'y trouvait.

Ces idées sur l'action combinée du froid et de l'alcool ingéré en excès ne seront peut être pas acceptées généralement. Elles sont en opposition, notamment, avec les doctrines d'un homme dont plus que personne nous admirons les recherches et les travaux en thérapeutique. Nous voulons parler du célèbre professeur Giacomini. D'après ce savant le froid augmente la tolérance de l'économie pour l'alcool au point d'en faire supporter, même par les individus les moins habitués à son usage, des quantités considérables. Il cite l'exemple de la retraite de Moscou où un certain nombre auraient dû la vie à l'ingestion de plusieurs bouteilles de rhum. Ce qui s'est passé sous nos yeux ne nous permet ni d'embrasser sa manière de voir, ni d'admettre comme authentiques les faits sur lesquels il s'appuie.

Une cause secondaire qui n'entra pour rien dans les asphyxies générales ou partielles déterminées par le froid, mais qui chez un certain nombre de sujets donna une gravité extrême à des lésions en elles-mêmes légères doit maintenant fixer notre attention. Beaucoup d'individus atteints de congélations superficielles trouvèrent, soit dans la nuit du 3 au 4 janvier, soit le lendemain à quelques lieues de Sétif ou dans cette résidence même, le



moyen de s'approcher de feux de bivouac, ou de foyers préparés à bonne intention pour leur venir en aide. Ce brusque passage d'une température glaciale à une température de quarante degrés, au moins, plus élevée, cette exposition subite de parties transies et congelées à une forte chaleur devinrent la source d'accidents très sérieux. On répète partout que les organes de l'homme ont une aptitude merveilleuse à s'harmoniser avec les milieux divers où ils peuvent être placés, cela est fondé sans doute mais sous une condition dont on ne tient pas généralement assez compte, c'est que le passage d'un milieu à un autre très-différent ne s'opérera pas d'une manière trop heurtée. Transportez brusquement un Kamtschadale dans les régions tropicales, certainement son aptitude d'harmonisation sera dépassée et il ne pourra vivre sous le nouveau ciel que vous lui aurez donné. Eh bien, ce qui est vrai de l'organisation prise dans son ensemble est vrai aussi d'une de ses parties. Laissez la main pendant quelque temps dans un vase rempli de neige, puis transportez la tout-à-coup dans une eau à 40° centigrades et vous éprouverez une véritable brûlure, une sensation aussi douloureuse que si vous l'aviez plongée dans de l'eau bouillante. Faites l'expérience contraire. Posez les doigts pendant quelques instants sur du mercure congelé, c'est-à-dire à 40°—0, et la même douleur, la même



sensation de brûlure sera provoquée par la brusque soustraction de calorique opérée sur eux. D'où la conclusion que ce n'est qu'à l'aide d'une série de transitions graduées que nos organes peuvent sans inconvénient passer d'une température à une autre très-différente. Si ces notions, qui sont d'ailleurs de science vulgaire et que tous les habitants des régions froides mettent en pratique depuis un temps immémorial, avaient été généralement connues, beaucoup d'accidents auraient été évités, beaucoup de mutilations eussent été prévenues. On n'aurait pas placé les hommes atteints de congélations partielles sous l'action directe de foyers caloriques plus ou moins intenses, mais on aurait commencé par les frictionner avec de la neige, puis on aurait plongé les parties atteintes dans de l'eau d'abord froide et dont la température aurait été ensuite successivement élevée avec prudence. De la sorte les tissus eussent été ramenés peu-à-peu, sans secousse et sans trouble à leur chaleur normale, et le nombre des gangrènes profondes que nous avons eu à traiter eût été infiniment plus restreint.

Il est du reste assez difficile d'expliquer nettement l'influence qu'exerce dans l'intimité des trames organiques une chaleur élevée survenant tout-à-coup après un froid intense et prolongé. Si une théorie peut jamais être formulée à ce sujet, elle aura à tenir compte tout à la fois d'une action



physique et d'une action vitale : après l'influence profondément hyposthénisante du froid, ce ne peut être sans inconvénient qu'un organe quelconque se trouve brusquement soumis à la stimulation énergique d'une température élevée ; après la stagnation sanguine que la congélation détermine dans les capillaires d'une partie, ce ne peut être sans dommage que les liquides de cette partie, brusquement dilatés par la chaleur, fassent effort contre les parois vasculaires qui les contiennent et cherchent à travers des capillaires en partie obstrués, à s'ouvrir un passage.

Les congélations aggravées par l'application intempestive de la chaleur ne m'ont paru différer de celles produites par l'action exclusive du froid qu'en ce qu'elles étaient généralement plus profondes et donnaient lieu à une gangrène à marche plus rapide. Ainsi, dans le cercle de mon observation, tandis que pour les premières la ligne de démarcation entre les parties mortes et celles demeurées vivantes, s'établissait en moyenne du troisième au quatrième jour ; pour les secondes cette ligne ne se formait que vers le sixième. Par contre, chez ces dernières, les escharres plus superficielles se détachaient généralement du neuvième au douzième jour, et ce n'était que du douzième au dix-septième qu'elles tombaient chez les sujets de la première catégorie. Après la chute des escharres,



la plaie dans l'un comme dans l'autre cas, apparaissait grisâtre, fongueuse, et suivait la même marche.

Pour quiconque n'a pas observé les congélations partielles des membres sur une grande échelle, le rôle que nous faisons jouer, avec la plupart des pathologistes, au calorique brusquement appliqué à une partie engourdie par le froid paraîtra peut être hypothétique. Dans un cas donné de gangrène survenue dans ces circonstances, il est en effet très-difficile ou même impossible de déterminer qu'elle a été la part du froid et qu'elle a été celle de la chaleur. On peut se demander si les accidents consécutifs à cette double action n'eussent pas été identiquement les mêmes alors même que le froid aurait agi exclusivement ? Mais quand on a en même temps sous les yeux un grand nombre de gangrènes survenues les unes après la seule application du froid, les autres après l'application du froid d'abord et de la chaleur ensuite ; quand on a constaté que les premières sont toutes superficielles et sans gravité, et que c'est parmi les secondes que se rencontrent tous les cas sérieux, tous ceux qui réclament des opérations et qui menacent l'existence, alors le doute n'est plus possible et il faut bien reconnaître que l'application d'une chaleur intense sur un membre congelé en rend les altérations plus profondes. Or, sur 355 malades atteints



de congélation qui ont passé par mon service, 72 m'ont dit s'être pendant la route assis à des feux de bivouac, 274 m'ont assuré avoir été du commencement à la fin privés de feu (1). Ceux-ci ont présenté 256 gangrènes peu étendues intéressant une partie ou la totalité de l'épaisseur du derme, 15 gangrènes étendues et ayant la même profondeur que les précédentes, 3 gangrènes plus profondes dont l'une a nécessité une opération. Ceux-là ont offert 2 gangrènes sans gravité, 11 gangrènes plus ou moins vastes et ayant mis sur quelques points les muscles à nu et 59 gangrènes profondes qui donnèrent lieu à 35 opérations. Les premières ont compté 2 morts, les secondes en ont compté 9. Ces chiffres dispensent de tout commentaire.

C'est ici le lieu de rapporter quelques observations qui permettront de suivre dans toutes leurs phases les effets de la congélation.

#### *Congélation au premier degré.*

L....., du 61<sup>e</sup> de ligne (salle 1<sup>re</sup>, n<sup>o</sup> 17), a fait partie de la colonne du Bou-Thaleb. Dans la nuit du 3 au 4 janvier seulement, le froid qu'il avait jusque-là supporté sans trop souffrir lui est devenu pénible. Il s'était tenu jusqu'alors en mouvement continuel, marchant, courant et battant la terre du

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(1) Il en est 9 qui n'ont point été interrogés sur cette circonstance.



pied lorsque le groupe auquel il appartenait faisait une halte. Mais cet exercice qui avait maintenu sa température à un degré suffisant lui devint tout-à-coup impossible. Une douleur très-vive, une sorte de brûlure ressentie dans les deux pieds le força à s'arrêter pendant plusieurs heures. Lorsqu'il voulut ensuite se remettre en route, la marche lui fût extrêmement pénible. Cependant ses douleurs ne tardèrent pas à se dissiper et il marcha avec ardeur, bien que ses pieds fussent devenus tout-à-fait insensibles. Il arriva le 4 à Sétif, vers cinq heures du soir. On le déshabilla et on le coucha entre des couvertures de laine. Il s'endormit d'un profond sommeil; mais le lendemain sur les quatre heures du matin, des douleurs vives dans les deux pieds le reveillèrent. On l'apporta à l'hôpital. Ses pieds sont chauds et tuméfiés, la peau qui recouvre leur face dorsale est rouge, érythémateuse. L'affection est restée d'ailleurs tout-à-fait locale, et l'ensemble des fonctions s'accomplit d'une manière régulière. Le sujet est mis à la demi-portion d'aliments puis aux trois quarts. On se contente de pratiquer des onctions avec de l'huile camphrée sur les pieds et d'envelopper ceux-ci de flanelle. Au bout de cinq jours le gonflement et la rougeur disparaissent; la desquamation a lieu, et 18 jours après son entrée dans nos salles, L..... est complètement rétabli.



Il y a un parallélisme frappant entre les effets que produisent sur nos tissus un froid intense et ceux qu'y déterminent une chaleur élevée. Ce parallélisme a dès longtemps fixé l'attention des praticiens; c'est pour le rendre évident à tous que nous avons voulu présenter des observations de congélations à tous les degrés. L'affection de L..... ne différait en rien de la brûlure au premier degré. Une congestion sanguine s'était opérée à la surface de la peau qui recouvre la face dorsale des deux pieds, on y trouvait rougeur, chaleur, douleur cuisante.... Mais la peau n'avait subi aucune déperdition, aucune phlyctène ne s'y était développée. Le gonflement des pieds était bien moins la conséquence de l'engelure que celle de la marche forcée. La marche de l'affection ne pouvait ici être que simple: pas de solution de continuité et par conséquent pas de cicatrice vicieuse à craindre, pas d'adhérences contre nature, etc.

*Congélation au second degré.*

B....., du 61<sup>e</sup> de ligne (salle 6, n<sup>o</sup> 16), arrivé des premiers à Sétif le 4 janvier, entre à l'hôpital le 15 du même mois pour les suites d'une congélation. Il est resté onze jours à la caserne sans réclamer de soins; au moment où il est soumis à notre observation son état est le suivant: pieds



rouges, engorgés et douloureux, phlyctènes à demi-remplies d'un liquide sero-purulent à la face plantaire des deux gros orteils, surface dénudée le long du bord externe du pied gauche et sur la face dorsale du cinquième orteil et du metatarsien correspondant; ici à peine reste-t-il quelques traces d'épiderme à la circonférence de la plaie; le corps muqueux est partout à nu et sur quelques points semble même altéré.

Le traitement consiste: 1° pour les phlyctènes des gros orteils à les ouvrir de manière à conserver l'épiderme et à livrer issue au liquide contenu au fur et à mesure de sa formation; 2° pour la plaie du pied gauche, à panser avec un linge fenêtré enduit de cérat. A part quelques points de cette dernière plaie où la suppuration se maintient, la guérison est bientôt obtenue. Nous avons revu le malade trois mois après sa sortie de l'hôpital. La cicatrice qu'il porte au pied gauche était lisse et solide mais présentait quelques petites taches irrégulières d'une couleur hépatique lesquelles doivent correspondre aux points où, pendant la maladie, nous avons trouvé le corps muqueux altéré.

Les accidents observés chez B..... sont exactement ceux qu'on rencontre après une brûlure au deuxième degré—Leur traitement a été modelé sur celui qui conviendrait à une semblable brûlure—



La cicatrice obtenue rend frappante la correspondance que nous cherchons à établir entre les plaies qui succèdent à l'action du calorique et celle qu'engendre l'action d'un froid intense—Cette triple proposition exige quelques mots de développement. 1<sup>o</sup> les accidents présentés par B.... ont été : rougeur, douleur et tension de la peau, formation de phlyctènes qui contenaient d'abord une sérosité limpide mais où, consécutivement, un liquide seropurulent se déposa ; arrachement sur une surface assez étendue de l'épiderme soulevé et dénudation du corps muqueux qui, sur plusieurs points, a perdu ses caractères normaux. Or, dans la division de Dupuytren les caractères essentiels de la brûlure au deuxième degré sont l'inflammation de la peau avec décollement de l'épiderme et formation de vésicules remplies de sérosité. Quant aux phénomènes consécutifs de la brûlure ils varient beaucoup suivant que les phlyctènes ont été ouvertes avec précaution ou maladroitement arrachées, suivant surtout que le corps muqueux a été ou non offensé. 2<sup>o</sup> Dans la brûlure au deuxième degré, ou bien les phlyctènes sont restées intactes, ou bien l'épiderme a été enlevé et le corps muqueux mis à découvert. Dans le premier cas le praticien ouvre la vésicule sur son point le plus déclive de manière à laisser une issue constante à la sérosité, et il respecte l'épiderme qui protège le corps mu-



queux et sous lequel une nouvelle pellicule épidermoïde ne tarde pas à se former. Dans le second cas une inflammation légère ou vive s'empare du corps muqueux qui peut subir une altération ou même une destruction plus ou moins étendue; presque toujours une suppuration assez abondante s'établit à sa surface. Le but du médecin doit être alors de modérer localement l'inflammation cutanée. Il surveille attentivement la marche de la cicatrice de façon à réprimer les tendances vicieuses, les végétations, etc. Cette conduite est exactement celle que nous avons tenue. 5° Quand après une brûlure le corps muqueux a subi une altération, la matière colorante acquiert une nuance foncée qui se traduit, dans la cicatrice, par des tâches fauves ou d'un jaune brun. Chez B..... où existait une semblable altération de la couche sous-épidermoïde, la cicatrice présente quelques petites tâches se rapprochant de la couleur des éphélides hépatiques.

Par leurs effets immédiats, par leur marche, par le traitement qu'elles réclament, par le caractère des cicatrices, les congélations et les brûlures du second degré semblent donc former une maladie identique.

*Congélation au troisième degré.*

A..... du 3<sup>e</sup> chasseurs d'Afrique (salle 5, n° 29),



blond, lymphathique, a fait à cheval la pénible expédition du Bou-Thaleb. Il est rentré à Sétif le 4 janvier à 5 heures du soir et s'est couché aussitôt. Après un sommeil paisible de deux ou trois heures il a été subitement réveillé par une sensation de brûlure fixée aux deux mains. Le lendemain, 5, il est entré à l'hôpital: la face dorsale de tous les doigts est couverte de phlyctènes contenant une sérosité roussâtre. Je lui accorde les trois quarts de portion et après l'ouverture des vésicules et l'écoulement de la sérosité, les deux mains sont pansées avec des linges imbibés d'huile camphrée. Du 10 au 12 l'épiderme se détache de tous les doigts et laisse à nu une surface à fond blanchâtre, parsemée de petites têtes mamelonnées d'un rouge assez vif. La partie blanchâtre de la plaie est manifestement le chorion, et les petits mamelons rouges sont les petits pelotons cellulux qui remplissent les cavités aréolaires et que traversent les expansions nerveuses et vasculaires pour se rendre à la face externe du chorion. Sur le doigt annulaire gauche seulement, le corps muqueux a été en partie conservé. Le 14, les ongles du pouce et du médius droits et ceux des deux indicateurs tombent. Le sujet est maintenu aux trois quarts et ses plaies sont pansées avec un linge fin fenêtré et enduit de cérat. Une suppuration abondante s'établit. Bientôt sur l'annulaire gauche le chorion



végète et, à travers la déperdition de substance subie par le corps muqueux, tend à projeter des prolongements qui ont l'aspect verruqueux. Le traitement s'attache dès lors à réprimer ces végétations de manière à maintenir la plaie lisse et égale, et à obtenir une cicatrice exempte de difformité. Sur les autres doigts de petits mamelons rouges deviennent de plus en plus serrés et finissent par faire disparaître la trame du chorion. Le pansement est ici le point important. Il doit être établi de telle façon que le pus, absorbé par les pièces de l'appareil au fur et à mesure de sa formation, ne reste point en contact avec les plaies. Pour obtenir ce résultat nous nous servons de compresses fenêtrées, à trous très-larges et très-rapprochés, par dessus lesquelles nous plaçons de la charpie, puis des bandelettes séparées entre elles de manière à livrer passage au pus s'il se formait en trop grande quantité. Dans les journées qui suivent, les plaies tendent à la cicatrisation et suivent la marche connue des solutions de continuité qui guérissent par seconde intention. Sur plusieurs des doigts la cicatrice, après un certain temps, a un aspect blanc mat qui indique l'imperfection du corps muqueux de nouvelle formation et l'absence de pigmentum. Sur le doigt annulaire gauche, au contraire, la cicatrice est comme marbrée de taches d'un blanc mat et de taches d'un jaune brun.



Cette observation n'a pas besoin de commentaire, elle démontre la quasi-identité des congélations et des brûlures au troisième degré. Il y a cependant une légère différence à établir entre ces phénomènes morbides. Il est très-rare qu'un corps comburant s'applique à nos tissus de manière à atteindre en profondeur égale tous les points qu'il touche, d'où plaies inégales et anfractueuses. Au contraire le froid a une action lente et graduée qui pénètre uniformément à travers les surfaces qui lui sont soumises; d'où plaies égales, unies, et pour lesquelles il est beaucoup plus facile d'obtenir une cicatrisation régulière.

*Congélation aux premier, second, troisième et quatrième degrés.*

V..... du 5<sup>e</sup> chasseurs d'Afrique (salle 2, n° 18), arrive à Sétif le 4 janvier à 4 heures du soir. Ses pieds sont insensibles, sa santé générale n'a pas souffert. Il soupe avec ses camarades, boit un litre de vin chaud et prend ses dispositions pour se coucher. Ses pieds sont tellement tuméfiés qu'il lui est impossible d'ôter ses bottes. Après de vaines tentatives il se décide à en fendre l'empaigne et s'abandonne ensuite au sommeil. Le lendemain matin 5 janvier, vers les six heures, le retour de la sensibilité s'opère brusquement dans les deux



pieds. Des douleurs vives et lancinantes y sont ressenties. Le gros orteil du pied gauche et les trois premiers orteils du pied droit deviennent le siège d'une sensation cuisante que V..... compare à une brûlure. Des phlyctènes se sont développées sur les parties les plus douloureuses. V..... croit cependant son état trop peu sérieux pour exiger des soins particuliers et il se contente de rester en repos à la caserne et de se faire sur les pieds quelques onctions avec de l'huile camphrée.

Le 10 janvier cependant, les douleurs et l'engourdissement des pieds persistant, il se décide à entrer à l'hôpital. La face dorsale des pieds n'a pas perdu son épiderme, elle est encore un peu rouge et a dû présenter quelques jours auparavant le caractère érythémateux (premier degré de la congélation). Une phlyctène existe à la face plantaire du gros orteil gauche, elle est grisâtre et laisse deviner sous elle l'existence d'une escharre. L'épiderme soulevé qui forme les vésicules des orteils droits est à peine altéré. Une double ponction est pratiquée en deux points opposés de chacune des phlyctènes, puis les pieds sont largement arrosés d'huile camphrée et enveloppés dans de la flanelle. Le sujet est mis aux trois quarts.

Le 21 janvier sur deux des orteils droits où, grâce à la conservation de l'épiderme soulevé, le corps muqueux n'avait pas été altéré (deuxième



dégré de la congélation) s'est formé un nouvel épiderme mince et luisant. Le 22 l'épiderme du troisième orteil droit se détache et met à découvert une surface rouge déjà garnie en partie d'une pellicule épidermoïde mais où se voient aussi deux points qui suppurent encore, et où le corps muqueux a été détruit (troisième degré de la congélation). Cette dernière partie est pansée avec un linge fenêtré comme il a déjà été dit.

Depuis trois jours l'épiderme épais et grisâtre qui formait la phlyetène du gros orteil gauche s'était séparé, mettant au jour une escharre assez épaisse, d'un gris terne, lorsque le 24 janvier cette escharre elle-même qui ne tenait plus que par quelques points aux tissus sous-jacents est enlevée. — La plaie que nous avons alors sous les yeux occupe toute la face plantaire du gros orteil et empiète un peu sur celle du métatarsien correspondant; elle a environ quatre centimètres carrés. Son fond est constitué par le tissu cellulaire sous-dermoïdal qui a déjà commencé à bourgeonner et sa circonférence taillée irrégulièrement permet de distinguer: 1<sup>o</sup> sous l'épiderme un liseré rouge qui n'est autre chose que le corps muqueux, 2<sup>o</sup> sous celui-ci un bord blanchâtre d'un aspect albuginé qui fait partie du chorion. — Ici donc le derme a été détruit dans tout son épaisseur et nous sommes en présence d'une congélation au quatrième degré.



—Le traitement a non seulement à favoriser la formation de la cicatrice mais encore à diriger celle-ci, à lui interdire toute tendance vicieuse, à empêcher les adhérences contre nature qui pourraient s'étendre du métatarsien à l'orteil et par suite amener la flexion permanente de celui-ci.— Pour satisfaire à ces indications un bandage approprié maintient le gros orteil dans une extension forcée et les pansements sont rétablis d'après les vues indiquées dans les observations précédentes. Nous faisons un fréquent usage du nîtrate d'argent qui a, tout à la fois, l'avantage d'égaliser les bourgeons charnus et de hâter la formation des tissus nouveaux. La plaie marche lentement jusqu'au 22 février mais à cette époque, le chorion détruit étant complètement réparé, la cicatrice se complète comme par enchantement et le 28 février le sujet sort de l'hôpital.

Nous ne reviendrons pas sur l'analogie qui existe entre les congélations et les brûlures. Elle doit être dès à présent évidente pour tout le monde. Contentons-nous, à propos de l'observation de V....., de présenter deux remarques. La première est relative au danger qu'il y aurait à abandonner à elles-mêmes les plaies situées au niveau des articulations quand elles sont larges et étendues. On sait la tendance presque insurmontable qu'ont les bords des solutions de continuité à se rapprocher et à fournir



par suite des cicatrices étroites qui, dans une foule de cas, déforment les organes et gênent les mouvements. Il n'est qu'un seul moyen d'éviter ce genre de difformité, c'est de donner aux parties une disposition telle que la surface de la plaie soit, jusqu'à parfaite guérison, aussi exagérée que possible. La cicatrice est par là forcée de s'étaler largement et si elle tarde un peu plus à se terminer, au moins n'a-t-on à craindre aucun accident consécutif. Dans un cas dont j'ai été témoin l'inobservance de ce précepte a amené une difformité grave. Il s'agissait d'un militaire qui portait aux deux pieds, à la face plantaire des orteils et des métatarsiens, une congélation au quatrième degré. Soit qu'il n'ait, à aucune époque de sa congélation, réclamé les secours de l'art; soit qu'il ait été indocile et n'ait pas voulu s'astreindre aux exigences du traitement, la cicatrice qui succéda à la chute de l'escarre s'était établie d'une manière si vicieuse qu'elle maintenait tous les orteils dans une flexion forcée. Dans la progression ceux-ci ne posaient plus sur le sol par leur face plantaire mais par leur extrémité. On comprend combien la marche devait être difficile et douloureuse. Lorsque ce sujet fut pour la première fois soumis à notre observation nous lui proposâmes une opération qui, en détruisant les cicatrices vicieuses, aurait permis de rendre au pied sa forme et ses usages. Nous



ne pûmes l'y décider et ne savons ce qu'il est devenu.

La seconde remarque que nous tenons à présenter se rapporte à la lenteur excessive avec laquelle la plaie de V..... avait d'abord marché et à la rapidité extraordinaire du travail de cicatrisation dans les derniers jours. Dupuytren avait déjà, à propos des brûlures, constaté que la formation nouvelle du chorion est une œuvre longue et qui coûte beaucoup à la nature mais qu'après l'achèvement de ce tissu la cicatrice des plaies se fait, en quelque sorte, du jour au lendemain. Son observation s'applique parfaitement à notre malade.

*Congélation au cinquième degré.*

G..... du 61<sup>e</sup> de ligne (salle 4, n<sup>o</sup> 22), recueilli à Aïn-Maleloul par l'ambulance qui y avait été établie, entre à l'hôpital de Sétif le 9 janvier. Il présente aux deux mains, sur la face dorsale des phalanges, une congélation au deuxième degré que nous nous contentons de mentionner. En outre, ses pieds sont rouges et tuméfiés et des phlyctènes grisâtres occupent les extrémités des orteils et les parties internes et inférieures des gros orteils. Le traitement consiste comme dans les cas précédents à ponctionner les vésicules en deux points opposés et à envelopper les parties d'une flanelle imbibée d'huile camphrée. Le sujet est mis aux trois quarts.



Jusqu'au 20 janvier rien de particulier n'a lieu, si ce n'est la diminution graduelle de la tuméfaction et de la rougeur des pieds mais, à cette époque, l'épiderme se détache et laisse voir : 1<sup>o</sup> sur les petits orteils, des escharres grisâtres et mollasses ; 2<sup>o</sup> à la face plantaire et sur le bord interne des gros orteils, une escharre de la même nature mais qui paraît plus profonde.

Les escharres des petits orteils se séparent du 26 au 28 et leur chute met à nu une surface bourgeonnante, fongueuse, constituée par le tissu cellulaire sous-dermoïdal. Celles des gros orteils tombent du 1<sup>er</sup> au 2 février, et permettent de constater sur quelques points, mais du côté droit seulement, la dénudation des tendons et des phalanges (congélation au cinquième degré). Du côté gauche la plaie repose sur le tissu cellulaire ; elle est fongueuse, saignante et de mauvaise nature. Le pansement est dirigé d'après les vues qui ont été exposées plus haut et, peu-à-peu, nous avons la satisfaction de voir les cicatrices s'établir sur les petits orteils d'abord et plus tard sur le gros orteil gauche. Quant au gros orteil droit il ne fait aucun pas vers la guérison ; il est le siège d'une suppuration abondante et le 25 février, au moment où nous reconnaissons que l'articulation métatarso-phalangienne vient d'être ouverte, nous nous décidons à l'amputer. 28 février. L'appareil est levé,



les bords de la plaie sont blafards mais en rapport. La tête du métatarsien est complètement couverte, le pied est en bon état. 3 mars. Un foyer est ouvert à la face plantaire du pied droit entre le premier et le second métatarsien. Il n'a aucune communication avec la plaie qui résulte de l'amputation. 5 mars. Nouvel abcès à la face dorsale du pied un peu en arrière de la tête du premier métatarsien. Il est ouvert et nous acquérons la preuve qu'il communique avec le précédent. A partir de ce moment l'écoulement du pus s'opère d'une manière facile. De jour en jour il est moins abondant; les bords des incisions se rapprochent, et le 22 mars la guérison est achevée. Il y avait déjà quatre jours que la plaie résultant de l'amputation du gros orteil était cicatrisée.

Nous n'avions pas soupçonné d'abord que l'escharre du gros orteil droit fut assez profonde pour rendre visibles, après sa chute, les tendons fléchisseurs et les phalanges elles-mêmes et nous nous étions livré à l'espérance d'obtenir une guérison facile et exempte de mutilation. Dans presque tous les cas de congélation aux 3<sup>e</sup>, 4<sup>e</sup> et 5<sup>e</sup> degrés, on éprouve des mécomptes analogues. La gangrène qui avait paru d'abord plus ou moins superficielle se trouve avoir pénétré profondément et quelquefois avoir atteint des parties essentielles aux mouvements. Cette difficulté du pronostic tient à ce



que le froid, qui s'exerce de l'extérieur à l'intérieur, n'a pas généralement assez d'intensité pour frapper de mort immédiate les tissus profondément situés; il diminue seulement leur vitalité et en rend la gangrène inévitable pour un moment peu éloigné. De là mortifications successives procédant du dehors au dedans et aggravant sourdement la position des malades. Ce mode d'action du froid explique comment quelquefois, après une première opération qui semblait faite dans les meilleures conditions et au moment où la guérison pouvait paraître prochaine, les chairs devenaient baveuses, fournissaient un pus mal lié et fétide et rendaient nécessaire un second retranchement des parties en un lieu plus élevé. La conclusion à tirer de ces remarques est que dans les congélations un peu profondes le pronostic doit être très réservé et dans aucun cas ne peut être formulé avant la chute des escharres.

En amputant le gros orteil droit dont les tendons fléchisseurs et les phalanges avaient été d'abord dénudés et dont l'articulation phalango-métatarsienne avait été consécutivement ouverte, je n'ai fait sans doute que me conformer à des préceptes consacrés par la pratique des plus grands maîtres. Cependant je n'ignorais pas les idées de M. Gerdy concernant les maladies des petites articulations et les succès assez nombreux obtenus depuis quelques années, dans des cas analogues à celui-ci, par la



méthode expectante. Peut-être me serais-je moi-même décidé à attendre chez V..... l'exfoliation spontanée des parties osseuses découvertes et la soudure de l'articulation si l'état du sujet d'une part et de l'autre l'encombrement des salles par des malades atteints presque tous de plaies suppurantes ne m'avaient imposé l'obligation d'arriver à la guérison par les moyens les plus décisifs et les plus prompts. J'aurai d'ailleurs plus tard l'occasion de rapporter quelques faits de guérison spontanée chez des malades qui offraient les mêmes conditions que V.....

*Congélation au sixième degré.*

N..... du 45<sup>e</sup> de ligne (salle 3, n<sup>o</sup> 4), est amené à l'hôpital de Sétif par une prolonge le 7 janvier. Ce malheureux était depuis le 4 dans un douar arabe et n'avait eu pour se nourrir pendant trois jours que deux biscuits. Son état général est très-alarquant. Il y a menace d'asphyxie : peau froide, violacée ou rouge-bleuâtre ; pouls lent et misérable ; respiration rare et faible ; langue fraîche et violette ; face grippée, yeux enfoncés. Les extrémités inférieures sont insensibles et tous les orteils, privés d'épiderme, laissent suinter de leurs chairs molles, noires et onctueuses une sérosité bistrée. Aucune ligne bien définie ne sépare les parties mortes de celles qui sont encore soumises à l'empire de la



vie. Bouillon, potion éthérée bis, vin de cannelle, frictions sèches, pansement des pieds avec de l'huile camphrée.

8 Janvier. Même état général. Nuit assez bonne, sommeil. Il y a deux selles liquides sans coliques, appétit.—Demi-riz au lait, potion gommeuse opiacée, même prescription du reste.

10 Janvier. L'état général n'a pas changé. Aucun mouvement fébrile n'est survenu et cependant le sujet délire. Langue naturelle, pas de soif, inappétence, diarrhée. La gangrène a envahi presque toutes les parties molles des pieds.

14 Janvier. Toujours même absence de réaction, même rareté de la respiration, même état misérable du poulx. Le délire se maintient; selles diarrhéiques nombreuses—Les pieds sont en putrilage—La gangrène a dépassé les malléoles—La mort a lieu le 15 janvier à une heure du matin.

*Autopsie quatorze heures après la mort.*

*Cavité crânienne.* Les sinus de la dure-mère sont remplis de sang ainsi que les veines qui rampent à la surface du cerveau. Pie-mère assez fortement injectée. La substance cérébrale est médiocrement sablée et d'une bonne consistance. Les ventricules sont sains.

*Cavité thoracique.* Quinze grammes de sérosité citrine dans le péricarde. Cœur naturel. Caillot peu volumineux dans ses cavités droites. Un peu de sang noir demi-caillé dans l'oreillette gauche,



Les poumons sont fortement engorgés à leur partie postérieure. Ils sont sains d'ailleurs. Muqueuse bronchique un peu trop rouge.

*Cavité abdominale.* La rate a le double de son volume normal, son tissu est rouge lie de vin, légèrement friable. Foie volumineux, gorgé de sang noir, bile très-peu abondante, jaunâtre, épaisse. L'estomac a une muqueuse rouge assez finement arborisée. Celle des intestins grêles est dans le même cas et présente en outre, vers la fin de l'iléon, un grand nombre d'ulcérations superficielles grandes comme des têtes d'épingles. La muqueuse du gros intestin est légèrement infiltrée et rouge et porte également des ulcérations superficielles qui sont surtout nombreuses vers le rectum.

L'examen des parties frappées de gangrènes découvre des muscles noirâtres, putrilagineux, d'où s'élève une odeur infecte. Tous les vaisseaux artériels et veineux, sont oblitérés jusqu'à une hauteur qui dépasse de huit à dix centimètres les limites supérieures de la mortification. Au reste les parois de ces vaisseaux ne paraissent point épaissies. Leur couleur d'un gris-rougeâtre sale semble avoir été en partie déterminé par l'imbibition des liquides qui les entourent.

Depuis le moment de la congélation la dépression des forces chez N..... a été constante. Aussi est-il difficile de nier que le froid a été seul et



exclusivement cause des accidents qu'il a présentés. Le froid peut donc directement enrayer la vie dans nos tissus, ou au moins lui porter une atteinte si profonde que la gangrène devient inévitable. Nous aurons à revenir sur ce fait qui est loin d'être admis par la majorité des pathologistes.

Le motif qui nous a empêché de pratiquer chez ce malade l'amputation des deux jambes fut bien moins l'absence d'une ligne de démarcation nette et tranchée entre les parties mortes et les parties vivantes que la dépression profonde des forces. Si la réaction s'était établie peut-être eussions nous, alors même que la gangrène n'aurait pas été définitivement bornée, eu recours à une double opération. Cette pratique hardie est en opposition avec les idées généralement reçues. Mais de tout temps elle a compté quelques partisans d'une grande autorité et, depuis plusieurs années surtout, ses adversaires deviennent moins nombreux et moins pressants. Nous avons, antérieurement, pour notre compte, recueilli quelques observations où pratiquées dans ces circonstances et en désespoir de cause, au moment où le sujet allait être entraîné par la gravité de l'affection locale et l'abondance de suppuration, les amputations ont eu un plein succès.

Les observations qui précèdent en même temps qu'elles établissaient un rapport d'analogie entre



les brûlures et les congélations ont dû donner aussi une idée générale assez exacte des effets du froid appliqué à nos tissus. Cette idée cependant serait trop incomplète si, nous bornant aux quelques cas particuliers dont elle est déduite, nous ne tentions de résumer rapidement en les généralisant, les faits nombreux qui ont été soumis à notre étude.

Nous distinguerons les effets morbides du froid suivant qu'ils sont limités à une région ou qu'ils ont atteint l'ensemble de l'économie.

*Effets locaux du froid.* La soustraction du calorique quand elle est portée à un certain degré fait pâlir les tissus, les rapetisse, les ride et y amène un engourdissement qui dans certains cas peut aller jusqu'à l'insensibilité. Ces phénomènes dépendent : 1<sup>o</sup> de l'action hyposthénisante que le froid exerce immédiatement et en premier lieu sur les nerfs de la partie ; 2<sup>o</sup> du ralentissement plus ou moins prononcé qui survient consécutivement dans le cours du sang. En d'autres termes les premiers effets matériels et appréciables d'un froid intense sur les organes vivants dérivent de la diminution des actions nerveuse et circulatoire. C'est donc dans les parties où déjà naturellement ces actions sont à leur minimum d'intensité que les effets du froid doivent se montrer le plus fréquemment et dans leur plus grande évidence. Ainsi, aux points périphériques extrêmes des systèmes nerveux et



circulatoire, aux orteils et aux doigts, les engelures et les congélations superficielles et profondes sont bien plus fréquentes qu'en tout autre lieu. Il faut d'ailleurs reconnaître que ces parties, à part leur éloignement des centres nerveux et sanguin qui les place dans des conditions spécialement défavorables, sont encore soumises à des influences fâcheuses d'une autre nature. Les mains sont généralement nues et reçoivent sans intermédiaire les injures atmosphériques pluie, neige, vent... Les pieds sont couverts, il est vrai, d'une chaussure épaisse qui les protège presque toujours efficacement quand le froid est sec, mais si à la froidure se joint la pluie ou une neige fondante il n'en est plus de même. Le cuir s'imprègne bientôt d'une humidité qui, le rendant meilleur conducteur de calorique, lui permet de soustraire aux tissus vivants une plus grande somme de chaleur; et puis la progression sur un sol détrempé met les pieds en contact continu avec un corps solide et très-froid dont la température tend à s'équilibrer avec la sienne, d'où encore soustraction calorique.

Il est d'autres parties qui, bien que peu éloignées des centres circulatoire et nerveux, sont cependant atteintes d'une manière spéciale par le froid. Par exemple les oreilles, le nez, la verge..... Ici une disposition anatomique particulière rend compte de la fréquence des congélations. Ces parties sont



dépourvues de tissus adipeux; les nerfs et les vaisseaux s'y ramifient superficiellement dans un tissu cellulaire plus ou moins rare qui les isole d'une manière très-incomplète des influences extérieures et les laisse presque sans défense exposés à leur injure. Les orteils, les doigts, les oreilles, le nez, la verge ne sont donc plus exposés aux congélations que parce qu'ils se trouvent dans une ou plusieurs des conditions suivantes: 1° éloignement des centres nerveux et circulatoire; 2° état habituel de nudité et d'exposition à l'air; 3° contact prolongé avec un corps très-froid et bon conducteur du calorique; 4° absence du tissu adipeux et position tout-à-fait superficielle des nerfs et des vaisseaux.

Les chiffres suivants permettront d'apprécier avec une exactitude suffisante la valeur relative de chacune de ces conditions. Sur 355 congélations il s'en est rencontré :

|                                 |            |
|---------------------------------|------------|
| Aux pieds. . . . .              | 325        |
| Aux mains. . . . .              | 6          |
| Aux pieds et aux mains. . . . . | 14         |
| A la verge. . . . .             | 5          |
| Aux oreilles. . . . .           | 6          |
| Au nez. . . . .                 | 1          |
| <b>TOTAL. . . . .</b>           | <b>355</b> |

On peut conclure à priori de ces chiffres que



c'est la présence d'une neige fondante sur le sol qui a été la principale et pour ainsi dire l'unique cause de notre désastre. Elle seule peut expliquer la proportion énorme des congélations aux pieds; et la rareté des congélations ayant un autre siège indique assez que la température à laquelle les troupes expéditionnaires étaient soumises n'avait rien d'excessif ni d'insoutenable. Nous n'avons point eu à signaler ici, comme autrefois Larrey, Moricheau Beaupré, Bégin à Moscou et à Wilna de ces congélations du nez et des oreilles brusquement établies et sans même que ceux qui en étaient victimes en aient eu conscience. C'est que le froid que nous avons eu à supporter n'était en effet en rien comparable à celui qui pendant l'hiver de 1812 arrêta les victoires de l'armée française en Russie. Bien qu'aucune observation thermométrique n'ait pu être faite sur place, nous pouvons cependant avancer que le froid atteignit à peine, pendant notre séjour dans les montagnes du Bou-Thaleb, le quatrième degré centigrade au-dessous de zéro. Ainsi la gorge où, pendant la nuit du 2 au 3 janvier, la division resta campée est à-peu-près au niveau de Sétif (1,400 mètres au-dessus du niveau de la mer) et, dans cette localité, le thermomètre ne descendit pas au-dessous de 0 — 2°.

La diminution des actions nerveuse et circulatoire qui constitue la période de retrait ou première



période, chez les individus qui ont ressenti à un degré pathologique l'influence du froid peut se maintenir continue jusqu'à la mort, ou bien être suivie d'une réaction plus ou moins intense. Nous avons à examiner la marche des phénomènes morbides dans l'une et l'autre catégorie et les indications thérapeutiques qu'elle peut offrir.

Première catégorie. Le maintien de la période de retrait et l'absence de toute réaction soit générale soit locale, ne se rencontrent guère que chez les individus faibles et valétudinaires : le froid alors, à côté des congélations partielles qu'il a produites a, dans tous les cas, porté une atteinte plus ou moins profonde à l'ensemble du système nerveux. Les fonctions générales languissent ; la respiration est rare, le pouls lent et misérable, la calorification presque nulle. Il n'y a ni soif ni appétit.... et ce sommeil de toutes les fonctions, si le traitement n'intervient pas, se continue jusqu'à la mort. D'autre part la mortification locale devient de jour en jour plus profonde et plus étendue. Les tissus qui n'étaient que violacés prennent une couleur brune puis noire ; les trames organiques perdent peu-à-peu leurs caractères et tombent en putrilage ; bientôt les tendons et les os sont dénudés et, tandis que ces ravages s'accomplissent dans les parties primitivement atteintes, la gangrène monte et de proche en proche envahit des membres entiers. Dans les cas de cette



nature le traitement a tout à la fois à se préoccuper de l'état général et de l'affection locale. Sous le premier rapport l'indication ne saurait être douteuse ; l'innervation doit être réveillée par tous les moyens dont on dispose. A l'intérieur : alcooliques, vin de cannelle composé, cannelle sous toutes les formes, éther. A l'extérieur frictions stimulantes. L'alimentation devrait sans doute être prescrite substantielle et excitante si l'estomac remplissait encore ses fonctions, mais dans la très-grande majorité des cas il n'en est point ainsi et les aliments liquides peuvent seuls être supportés. En nous conduisant d'après ces vues nous avons été assez heureux pour provoquer dans quelques-uns des cas où la dépression des forces se maintenait depuis quatre et cinq jours une franche réaction suivie bientôt d'une délimitation de la gangrène locale.

Parmi les observations se rattachant à cette catégorie et traitées par les stimulants intérieurs et extérieurs nous choisirons les deux suivantes terminées l'une par la mort, l'autre par la guérison.

*Congélation des deux pieds. — Maintien de la période de retrait. — Traitement stimulant. — Mort le 28<sup>e</sup> jour. — Gangrène du poumon.*

C..... du 43<sup>e</sup> de ligne (salle 5, n<sup>o</sup> 57), entre à



l'hôpital le 6 janvier. La face dorsale et les orteils des deux pieds ont une couleur bleue foncée. Il y a un peu de tuméfaction autour des malléoles. Absence de douleur; insensibilité des parties malades. L'état général est le suivant: peau bleuâtre et froide, pouls lent et petit, respiration rare, langue d'un rose livide, humide et fraîche—appétit—selles naturelles—pas de toux.—Quart, vermicelle au gras, deux œufs: vin de cannelle composé, frictions sèches sur les membres, le thorax et l'abdomen: les pieds sont entourés de flanelles imbibées d'huile camphrée.—7 Janvier. Les aliments qui ont été ingérés la veille ont été vomis; aucun changement n'est survenu soit aux pieds, soit dans l'état général.—Vermicelle au gras, même prescription que la veille.—12 Janvier. Le sujet dort bien; malgré l'appétit qu'il accuse il ne peut rien supporter au-delà du potage—Même état général—La gangrène se prononce aux orteils et sur le dos des pieds—Même prescription—13 Janvier. La réaction semble vouloir s'établir—La peau est un peu plus chaude, le pouls un peu plus fréquent et plus plein, mais bientôt ce mouvement cesse et les fonctions retombent au type des jours précédents—19 Janvier. La gangrène monte lentement: au pied gauche elle atteint les malléoles, au pied droit elle n'a pas dépassé le coude pied. Les parties mortifiées sont molles, humides, cre-



vassées et donnent issue à des gaz. L'état général n'a pas changé. Les prescriptions sont restées les mêmes. Le sujet tousse et se plaint d'une douleur dans l'épaule droite. L'auscultation démontre à la partie supérieure du poumon droit un râle à bulles très-inégales; la sonorité en ce point est normale. Rien n'est changé à la prescription.—22 Janvier. La dépression des forces se maintient, la toux est plus fréquente, la douleur à l'épaule plus prononcée, expectoration d'un mucus sale, gris-brun.—L'auscultation et la percussion fournissent les mêmes données que le 19.—Vu l'état du sujet il est impossible de songer à la saignée; nous prescrivons un large vésicatoire sur le côté droit du thorax.—27 Janvier. Dépression plus grande des forces, visage décomposé, toux, expectoration d'un mucus bourbeux auquel se mêle du sang altéré, fétidité de l'haleine, la douleur de l'épaule droite a peut-être un peu diminuée.—La gangrène des extrémités inférieures dépasse les malléoles de quatre travers de doigt à gauche, d'un seul à droite. Sur l'un et sur l'autre pieds, les tendons extenseurs des orteils sont à découvert et se détachent sur un fond putrilagineux.—Il nous semble évident que C..... est atteint d'une gangrène pulmonaire, et que sa mort ne peut tarder. Il succombe en effet le 3 février au milieu des phénomènes signalés dont l'aggravation dans les derniers jours avait été graduelle.



*Autopsie dix heures après la mort.*

Sujet amaigri. Rigidité cadavérique presque nulle.

*Cavité crânienne.* Le cerveau et ses enveloppes ne présentent rien de particulier si ce n'est leur pâleur et la vacuité de leurs vaisseaux.

*Cavité thoracique.* Le péricarde renferme environ soixante grammes d'une sérosité presque incolore. Le cœur est flasque et ses cavités sont vides. Le poumon gauche est médiocrement engorgé à sa partie postérieure. Le droit dont les deux lobes inférieurs sont le siège d'un engorgement spumeux assez considérable, offre en outre dans son lobe supérieur une altération grave qui doit être décrite minutieusement. A l'extérieur ce lobe est brunâtre. Si on le saisit entre les doigts on reconnaît dans son tissu un surcroît de densité. Divisé par le bistouri, dans le sens de sa longueur, il montre un parenchyme noirâtre d'où s'écoule un liquide bistré et dont l'odeur est repoussante. Ce parenchyme a manifestement subi la mortification. Il renferme une cavité irrégulière qui admettrait une orange moyenne et dont les parois sont formées immédiatement par le tissu même du poumon sans intermédiaire de fausses membranes. Dans l'intérieur de cette cavité flottent quelques ramifications vasculaires et bronchiques qui se détachent de sa



circonférence et, chose plus remarquable, bien qu'elle soit assez fréquente dans les gangrènes pulmonaires, un fragment de poumon mortifié gros comme un œuf de pigeon s'y rencontre aussi. Ce fragment toutefois n'est pas complètement libre; il tient encore aux parois du foyer par un pédicule vasculaire et bronchique épais de quatre millimètres. La gangrène pulmonaire n'a point, comme cela a été observé si souvent, déterminé de pneumonie sur les limites où reparaissent les tissus vivants; elle est simple et exempte de toute complication. La muqueuse des bronches est d'un gris-brun.

*Cavité abdominale.* Rate petite, indurée. Foie petit, d'un jaune-pâle; bile peu abondante, d'un vert foncé. La muqueuse de l'estomac a une blancheur demi-transparente et semble avoir perdu de son épaisseur et de sa consistance; celle des intestins grêles est dans le même cas; la muqueuse des gros intestins est naturelle.

L'examen des extrémités inférieures démontre, indépendamment de la gangrène signalée pendant les derniers jours de la vie du sujet, une oblitération des artères et des veines remontant à deux centimètres plus haut.

Bien que dans ce cas le traitement stimulant n'ait point été suivi de succès il est impossible de ne pas reconnaître que lui seul était logique et



aurait pu, si le mal n'avait été au-dessus des ressources de l'art, déterminer la guérison. En effet, pendant la vie aucun phénomène de réaction ne s'est montré, aucun symptôme de phlegmasie n'a pu être saisi; le sujet est resté dans un état hyposthénique non interrompu. Après la mort aucune lésion anatomique propre à l'inflammation ne s'est rencontrée dans les organes; tous les tissus au contraire ont été trouvés pâles, exsangues et tels qu'on pourrait les rencontrer chez un individu qui, jusqu'à bien portant, succomberait à une hémorrhagie de cause externe. L'hyposthénie était donc ici bien évidente; elle avait été produite par l'action d'un froid prolongé et la gangrène des pieds d'abord, des poumons ensuite ne peut être considérée que comme une conséquence de son existence.

*Congélation-sphacèle des orteils. — Maintien de la période de retrait pendant cinq jours. — Emploi des stimulants. — Guérison.*

B..... chasseur au 5<sup>e</sup> bataillon d'infanterie légère d'Afrique, lymphatique, usé par des excès de tout genre entre à l'hôpital de Sétif le 9 janvier. Il a eu à supporter comme tous ses camarades le froid et la privation d'aliments pendant les journées des 2, 3 et 4 et a ensuite été recueilli dans un douar arabe. Au moment où il se présente à notre



observation nous constatons l'état général et les lésions locales que voici : peau froide et violacée ; pouls petit et lent ; douze respirations par minute ; langue d'un rose légèrement livide, humide et fraîche ; pas de soif, désir d'aliments. Les pieds sont à peine enflés, leurs orteils sont tous livides et tachetés de noir. Nous croyons avoir à faire à un état hyposthénique simple et nous prescrivons un traitement stimulant. Quart ; riz au gras ; deux œufs ; demie de vin. Potion éthérée à prendre de suite et vin de cannelle composé pour la journée. Frictions sèches sur les membres, le thorax et l'abdomen. Pansement des pieds avec une flanelle imbibée d'huile camphrée. — 10 Janvier. Les aliments de la veille ont été rejetés par l'estomac. L'état général est le même. Riz au gras, même prescription médicamenteuse. — 14 au matin. L'état général n'a pas changé. La faiblesse du pouls, la rareté de la respiration, la fraîcheur de la peau et de la langue indiquent une dépression des forces aussi profonde que le premier jour. Les orteils sont sphacelés et une nuance bleuâtre légère se montre déjà sur la peau qui recouvre la tête des métatarsiens. La prescription n'a pas varié. Nous insistons sur les mêmes moyens. — Dans la journée la réaction paraît vouloir s'établir. — La peau a une température presque normale, le pouls a un peu plus de fréquence et de plénitude. Il y a dix-



huit respirations par minute. Le soir cette réaction se maintient. L'expérience de cas tout récents, où la réaction s'était éteinte peu d'instants après son apparition en laissant le malade dans un état aussi grave qu'auparavant, ne nous permet pas de nous livrer à la confiance. Les moyens stimulants sont continués. — 15 Janvier. La réaction générale n'a pas augmenté mais elle s'est maintenue ce qu'elle était la veille. Les pieds d'ailleurs sont le siège d'une rougeur et d'une chaleur qui n'existaient pas hier au soir et qui sont d'un bon augure. La gangrène des orteils est dans le même état et aucune ligne de démarcation ne s'est établie entre les parties sphacélées et les parties vivantes. — 17 Janvier. La respiration et la circulation sont normales, la peau est bonne; le sujet a eu hier pour prescription : soupe; vermicelle au gras; deux œufs; demie de vin; vin de cannelle composé. La digestion a été facile et il demande une augmentation d'aliments. Les selles sont régulières. Un cercle rougeâtre commence à se dessiner entre les orteils mortifiés et les métatarsiens. De ce moment nous croyons devoir nourrir notre malade comme un homme bien portant et suspendre la médication stimulante qui, ayant atteint son but, n'aurait plus d'objet ou pourrait même porter la réaction trop haut. Les frictions et le vin de cannelle sont suspendus et la demi-portion d'aliments est accordée.



— 24 Janvier. L'état général est excellent. La gangrène des orteils est définitivement bornée; elle rend nécessaire, aux deux pieds, l'ablation des quatre derniers orteils et, du côté droit seulement, la résection de la tête des second et troisième métatarsiens. La face plantaire des deux gros orteils a subi, par suite de la chute des escharres, une déperdition de substance qui a mis à nu les tendons fléchisseurs et les phalanges. Des deux côtés l'articulation phalangienne est ouverte; néanmoins nous croyons pouvoir attendre l'exfoliation des surfaces osseuses nécrosées et la soudure des articulations ouvertes. Peu à peu en effet le fond des plaies se remplit de bourgeons et le 2 mars la cicatrisation en est achevée. Une ankilose existe à la vérité à l'articulation phalangienne des deux côtés, mais l'inconvénient qui en résulte ne saurait être comparé à la perte de ces parties.

Cette observation m'a surtout paru intéressante par la clarté et la simplicité avec lesquelles les phénomènes s'enchaînent. Un froid prolongé est ressenti; l'état hyposthénique général s'établit et la gangrène survient aux orteils des deux pieds.— Sous l'influence d'une médication fortement stimulante l'état hyposthénique général cesse d'abord et, trente-six heures après, une réaction locale survient qui arrête les progrès de la gangrène et provoque une ligne de démarcation entre les parties



vives et celles déjà mortifiées. On ne peut rien de plus clair que cette évolution.

Après l'indication générale, chez les sujets qui offrent en même temps des congélations partielles et une dépression profonde et non interrompue des forces, nous avons dit que l'indication locale méritait une grande considération. Quel traitement faut-il appliquer aux gangrènes locales? Peut-on établir en règle absolue l'opportunité ou l'inopportunité des amputations à leur égard? Cette question n'a point, que nous sachions, été agitée dans la science. Les praticiens, il est vrai, ont débattu la convenance de l'amputation dans les cas de gangrène non limitée. Ils s'accordent presque tous à reconnaître que quand une semblable gangrène est déterminée par une cause interne il n'y a pas lieu à opérer; et que l'opération au contraire peut être faite dans beaucoup de circonstances où la mortification est la conséquence d'une action externe. Mais cette doctrine ne s'applique pas au cas que nous soulevons. Il s'agit en effet pour nous de gangrène non limitée et déterminée par une influence externe (le froid), gangrène qui en outre est compliquée d'un état général grave. Or c'est cette complication qui fait toute la difficulté de la position. Ainsi qu'une observation antérieure a pu le faire pressentir (page 59, exemple de congélation au sixième degré), dans les cas de dépression pro-



fondes des forces nous avons cru devoir nous abstenir de toute opération. Nos motifs ont été les suivants :

1<sup>o</sup> Au point de vue théorique, une dépression profonde des forces qui se maintient depuis plusieurs jours, malgré l'emploi d'une médication fortement stimulante, et dont la cessation ne peut être prévue est, à nos yeux, une contre-indication à opérer : d'une part parce que, sous son influence, la gangrène peut s'emparer consécutivement des parties respectées par l'opération ; d'autre part parce qu'alors même que ce résultat n'a pas lieu, le peu de vitalité du moignon doit mettre obstacle à la formation de la cicatrice et faire de la plaie une surface fongueuse dont la suppuration intarissable entraînera tôt ou tard le malade.

2<sup>o</sup> Au point de vue pratique, les observations peu nombreuses qui, à notre connaissance, existent dans les auteurs, d'amputations pratiquées pour des congélations partielles *malgré que l'économie toute entière ait été opprimée par le froid et qu'aucune réaction, soit générale soit locale, ne se fut montrée* se sont toutes terminées par la mort. Ainsi le pauvre breton, serviteur d'étable dont parle Ambroise Paré. Ainsi les faits que cite Mauquest de la Motte d'une vieille demoiselle qui, par avarice se laissait mourir de froid et de faim et du serviteur qui, en curant un puits, fut saisi d'un froid violent et d'une gan-



grène au pied gauche, etc.... Ces observations, tant à cause de la naïveté du style que pour l'enseignement pratique qu'elles renferment, nous semblent d'un si grand intérêt que nous n'hésitons pas à les transcrire ici en les débarrassant toutefois des détails oiseux et des longueurs qu'elles contiennent.

*Gangrène par congélation. — Amputation. — Mort.*  
(Ambroise Paré. Édition de 1728, page 471).

« Aussi me souvient qu'en temps d'Hyuer, vn pauvre Breton, seruiteur d'estable, demeurant à Paris, s'en alla coucher sus un liet, apres auoir bien beu, pres lequel y auoit vne fenestre à demy-ouuerte par laquelle le froid entra : et tellement luy altéra l'vne de ses iambes, qu'à son réueil pensant se leuer, ne se peut soustenir. Et pourtant fut posé près le feu, duquel il approcha sa iambe, cuidant qu'elle fut seulement endormie : mais se brusla la plante des pieds d'épaisseur d'un doigt sans rien sentir : parce qu'elle estoit jà mortifiée par le froid plusqu'à la moitié. Le lendemain le dit Breton fut apporté à l'Hostel-Dieu, où il fut visité par le chirurgien, et autres, lesquels conclurent qu'il estoit nécessaire couper et amputer la dite iambe ainsi mortifiée ; ce qui fut fait : mais ce neantmoins la dite mortification gaigna les parties supérieures, en sorte que dedans trois iours apres



le dit Breton mourut avec sueur froide, resueries, grands roulements et syncopes. »

Bien qu'Ambroise Paré ne dise rien de la dépression des forces dans l'observation qu'on vient de lire, son existence au moment de l'amputation ne peut être mise en doute. La marche des phénomènes l'indique et d'ailleurs Paré était observateur trop exact pour avoir passé la réaction sous silence si elle avait eu lieu.

*Gangrène des deux pieds consécutive à un froid intense et prolongé et à une alimentation insuffisante. — Amputation des deux jambes. — Mort.* (Mauquest de la Motte, 3<sup>e</sup> édition, tome 2, page 294).

« Au mois de février 1684, dit de la Motte, l'on m'envoya prier d'aller voir une demoiselle, âgée de plus de soixante années, qui pendant les rigueurs du très-fâcheux hiver qu'il fit cette année, demeura dans son lit sans allumer de feu, et vivant de pain et d'eau : Je trouvais cette demoiselle dans une extrême saleté, avec les deux pieds, jusqu'au dessus des malléoles livides et sans sentiment quoiqu'on la pinçât et piquât fort avant. La seule chose qu'il convenait de faire était de couper les deux jambes. Mais deux consultants appelés un peu plus tard décidèrent que l'âge avancé et la faiblesse



de la malade ne permettaient pas d'entreprendre cette opération.

Trois jours ensuite un autre médecin jugea l'opération praticable m'envoya chercher de nouveau et me fit avertir d'apporter avec moi ce qui convenait pour ces deux opérations. La jambe droite fut amputée la première avec l'appareil et les précautions alors en usage. Les artères ne furent point liées mais, pour prévenir l'hémorrhagie, les orifices artériels reçurent des boutons de vitriol sur lesquels furent placées de petites compresses, de l'étoupade, etc. Quatre heures après, la malade ayant pris un bon bouillon, deux œufs frais et une rotie au vin, la seconde jambe fut amputée. Les deux opérations furent bien supportées. Un régime tonique et substantiel fut prescrit et la cure sembla d'abord devoir être prompte, mais ce bon état ne fut pas pour longtemps, parce qu'aussitôt que cette demoiselle fut retournée chez elle, elle reprit son mauvais train de vie, qui lui causa un cours de ventre si violent, qu'il l'emporta en fort peu de temps. »

*Gangrène du pied gauche, suite d'un froid intense.*

— *Amputation de la jambe. — Mort.* (Mauquest de la Motte, tome 2, page 502).

« Au mois de juillet 1725, M. des Rosiers l'aîné fut demandé chez un Gentilhomme de cette ville,



pour voir un valet qui venait de sortir du fond d'un puits, dans lequel il était descendu pour l'écurer, et où il fut saisi d'un froid si violent, auquel se joignit une douleur au gros orteil gauche, si vive et si cruelle, qu'il fut obligé de quitter l'ouvrage et de se mettre au lit, où il souffrait extrêmement de cette douleur, qui loin de se fixer à ce doigt de pied, augmenta de telle manière qu'elle avait atteint les malléoles quand M. des Rosiers arriva.

Ce chirurgien sentant froid le pied de son malade, fit assembler ses confrères du nombre desquels j'étais. Nous convînmes d'un avis unanime, de la nécessité d'amputer au plutôt cette jambe, parce que la gangrène se faisait déjà apercevoir jusqu'en la partie moyenne de la jambe; et cette mortification qui n'avait atteint tout au plus que les malléoles quand M. des Rosiers arriva, parut si considérablement augmentée une heure après, lorsque l'appareil fut prêt, que ce chirurgien qui devait faire l'opération, eut peine à s'y déterminer, par l'inquiétude où le mettait ce qui pouvait en arriver, tant le progrès de la mortification se faisait brusquement, ne restant guère davantage que ce qu'il fallait pour faire l'amputation au-dessus et en partie saine. Cette opération fut pourtant très-heureusement exécutée, cet homme la soutint à merveille et se porta fort bien; l'extrémité des os s'exfolia,



sans que le malade eût un seul moment la fièvre, et la plaie se cicatrisa de la grandeur d'environ un demi-écu; il parut en son milieu un léger suintement d'une matière blanche comme du lait qui augmenta peu-à-peu, de sorte qu'elle vint jusqu'à la quantité de deux à trois livres à chaque pansement, sans compter ce qui s'écoulait dans les compresses et le bandage: à cela se joignit un cours de ventre des plus violents, ce qui réduisit ce pauvre jeune homme en quinze ou dix-huit jours, dans un tel état qu'il ne lui resta que la peau sur les os; et il mourut sans que ce qui restait à se cicatriser de son moignon eut augmenté ni diminué en aucune manière, depuis que cet écoulement purulent eût commencé à se faire. »

Deuxième catégorie. Les sujets qui ont été soumis à un froid assez intense pour produire des congélations partielles présentent, en général, après un temps qui varie de quatre à vingt heures, une double réaction: l'une générale, presque insensible, qui se traduit par une légère élévation de température à la peau et un peu d'accélération dans le pouls; l'autre locale, beaucoup plus prononcée, qui se manifeste par des douleurs et du gonflement, de la chaleur et de la rougeur. Toutes choses égales d'ailleurs, on peut poser en principe que les congélations sont d'autant moins graves que la réaction s'est opérée plus tôt. Au moins, parmi les malades



soumis à nos soins, ceux qui ont présenté le mouvement réactionnaire dans les huit heures après leur arrivée à Sétif sont les seuls chez lesquels la congélation n'a pas dépassé le deuxième degré. Les autres furent tous atteints de gangrènes. L'influence de la réaction sur les congélations ou asphyxies partielles fut au reste très-variable. Chez quelques-uns, en petit nombre, elle n'empêcha pas la gangrène de se déclarer. Chez d'autres, également peu nombreux, elle ramena la chaleur et la vie dans des tissus déjà marbrés de bleu, livides et ne différant en rien, à l'œil, de ceux qui, chez plusieurs sujets, subirent plus tard la mortification. Dans la presque majorité des cas, elle sembla arrêter la nuance bleue ou brunâtre et circonscrire les parties qui seront plus tard envahies par la gangrène. Néanmoins, dans ces deux derniers cas même, son action bienfaisante fut toujours incomplète. Elle put raviver les parties où la mort était imminente mais non faire disparaître tous les effets de la congélation et, en particulier, ces douleurs qui après plusieurs mois se montrent encore par intervalle et se maintiendront peut-être pendant de longues années. Elle put enrayer les progrès de l'asphyxie partielle mais non rétablir les tissus qui y confinaient dans leur vitalité normale et interdire par là des gangrènes consécutives et des plaies de mauvaise nature. Chez les malades de cette seconde catégorie, sauf



quelques exceptions rares où la constitution exigeait des soins spéciaux, l'état général ne fournissait aucune indication autre que le besoin d'une alimentation réparatrice. Il ne s'agissait plus de stimulation passagère à provoquer par l'emploi du vin, de l'éther, de la cannelle mais bien d'une réparation stable et solide, d'une reconstitution énergique des tissus par l'apport, dans la circulation, d'éléments nutritifs abondants et d'un bon choix. Cette condition était indispensable dans presque tous les cas pour éviter, après la chute des escharres ou après les opérations, les suppurations sereuses et mal liées et les plaies fongueuses qui, plusieurs fois à ma connaissance, nécessitèrent, chez le même sujet et pour le même mal, jusqu'à trois et quatre opérations sur des points successivement plus élevés. Quant à l'affection locale elle présentait des indications multiples. Nous nous préoccupâmes principalement du mode de pansement des plaies, de la nature des topiques qu'elles réclamaient, des moyens les plus sûrs d'empêcher les cicatrices vicieuses et enfin de l'opportunité de l'amputation dans les cas de gangrène non limitée. Nous avons déjà eu l'occasion dans les pages qui précèdent de formuler nos principes sur la plupart de ces questions. Mais ils sont épars ça et là dans les réflexions qui suivent les observations particulières. Nous croyons devoir les reproduire succinctement.



Au premier degré de la congélation le repos suffit généralement pour faire cesser l'érythème et le gonflement. Les onctions huileuses sont cependant utiles, elles allègent la douleur et rapprochent le moment de la guérison.—Au second degré les phlyctènes doivent être ouvertes de manière à maintenir l'épiderme soulevé sur le corps muqueux sous-jacent. Si déjà l'épiderme avait été enlevé la plaie devrait être pansée avec un corps gras et une attention toute particulière devrait être accordée au corps muqueux, dont l'altération amène des cicatrices marquées de taches fauves ou d'un jaune-brun et dont la destruction entraîne la privation du pigmentum et la décoloration de la peau de nouvelle formation.—Au troisième degré il n'y a plus à songer à la nuance qu'aura la cicatrice. Elle sera nécessairement de la couleur blanc mat qui est propre aux Albinos; mais il importe de réprimer les végétations et d'empêcher le pus de croupir sur la plaie. Le premier but s'obtient facilement par l'emploi de l'azotate d'argent; le second par l'emploi de compresses fenêtrées, à trous très-larges et très-rapprochés et par le soin de ménager, entre les tours de bandelettes qui maintiennent l'appareil, des intervalles convenables. — Au quatrième degré de la congélation les indications sont à peu près les mêmes que pour le degré précédent; mais c'est surtout ici qu'il faut réprimer la tendance des



plaies à se cicatriser vicieusement. Pour cela il est nécessaire de leur donner, jusqu'à complète guérison, une superficie aussi étendue que possible. — Les cinquième et sixième degrés présentent fréquemment des dénudations de phalanges et l'ouverture des articulations inter-phalangiennes ou phalango-métatarsiennes; quelquefois elles montrent des gangrènes qui, malgré l'établissement de la réaction, deviennent de plus en plus envahissantes et menacent le tronc. Dans le premier cas nous avons montré qu'il ne fallait pas se hâter d'opérer et qu'il était souvent convenable d'attendre l'exfoliation des phalanges mises à nu et la soudure des articulations ouvertes. Dans le second cas nous avons fait pressentir qu'il pouvait y avoir lieu à amputer alors même que la gangrène n'était point encore limitée. Cette pratique condamnée par beaucoup de chirurgiens entr'autres Sharp, Pott, Boyer, Sir A. Cooper n'est pas toujours suivie de succès, mais dans plusieurs cas cités par Larrey, Dupuytren, MM. Velpeau, Laurence, Guthrie, Gouraud, Hutchinson, Hennen, S. Cooper, etc., elle arracha les malades à une mort imminente. Il est certain que si la mortification de plus en plus étendue qui survient dans un membre tient à une cause générale d'une grande puissance ou à une lésion de ses principaux vaisseaux, jusqu'en un point que l'instrument ne peut atteindre, toute opération est par



cela même inutile. Mais les gangrènes envahissantes ne tiennent pas toujours à de semblables motifs. Leur cause peut procéder de bas en haut; le foyer gangréneux, en infectant de proche en proche tous les tissus et même l'économie entière, peut à lui seul déterminer leur extension. C'est en ce sens qu'on a dit que la gangrène engendre la gangrène. Nous croyons devoir terminer ce chapitre par quelques observations en rapport avec les vues générales qui y sont exposées.

*Congélation et gangrène de tous les orteils. — Réaction générale et locale. — Diminution des accidents puis extension rapide de la gangrène au membre abdominal droit. — Amputation de la cuisse droite. — Mort.*

F....., fourrier au 3<sup>e</sup> bataillon d'infanterie légère d'Afrique a été pris le 4 janvier, en cheminant sur un sol couvert de neige fondante, d'un engourdissement douloureux et bientôt après de l'insensibilité complète des deux pieds. Arrivé à Sétif vers les sept heures du soir il prit un peu de vin chaud et se coucha. A une heure du matin il fut éveillé par des douleurs aux pieds vives et cuisantes comme une brûlure. Le lendemain, 5, il entra à l'hôpital: de larges plaques d'un brun presque noir couvrent tous les orteils et les têtes des métatarsiens du



pied droit. Quelques phlyctènes existent sur les deux premiers orteils du pied gauche. Les deux pieds sont rouges, gonflés et chauds. La réaction générale est franchement dessinée. Le pouls est à 75 assez plein et assez fort, la peau a une bonne température, le facies est légèrement animé, les fonctions générales se font bien, il y a de l'appétit. Les phlyctènes sont ouvertes, les pieds enveloppés de flanelle imbibée d'huile camphrée et le sujet est mis à la demi-portion d'aliments sans vin. — 7 Janvier. L'engorgement du pied droit a presque disparu, la douleur est beaucoup moins forte, les nuits sont bonnes; même régime et même pansement. — 8 Janvier. Peau sèche et chaude, pouls petit à 84. Céphalagie, langue blanche et humide, selles naturelles. Le pied droit est infiltré. Diète, même pansement. — 9 Janvier. L'infiltration du pied droit s'est étendue à la jambe; sur le pied et autour des malléoles la peau, saine en apparence, est couverte de phlyctènes. La partie antérieure de la face plantaire a perdu son épiderme et laisse voir une surface rouge-brun; tous les orteils du même pied sont sphacelés. Deux heures après la gangrène dépasse les malléoles et une tuméfaction de mauvais augure s'est emparée du membre tout entier. En présence d'accidents aussi graves et de cet envahissement rapide de la gangrène nous croyons ne devoir point attendre une délimitation entre les



parties mortes et les parties vives. Nous nous hâtons d'amputer la cuisse à son tiers inférieur. L'opération ne présente rien de particulier. Elle a été supportée avec courage; 500 grammes de sang environ se sont écoulés; les muscles divisés par l'instrument paraissent sains; le tissu cellulaire sous-cutané est au contraire distendu par des gaz, circonstance fâcheuse à la vérité mais qui néanmoins, dans quelques cas d'amputation rapportés par divers auteurs, n'a pas empêché la guérison. La réunion par première intention est tentée et, sans nous abandonner à une confiance aveugle, nous espérons encore que l'existence de F.... pourra être conservée. Cependant une heure après l'opération des vomissements ont lieu; à cinq heures du soir le sujet délire, il chante et gémit tour-à-tour; le pouls est petit et si fréquent qu'il est impossible d'en compter les pulsations. A dix heures du soir emphysème de tout le tissu cellulaire sous-cutané; une plaque gangrèneuse très-étendue est constatée sur le côté droit de la poitrine, au milieu de sa hauteur et en un point déclive. La mort arrive le lendemain à quatre heures du matin, dix-huit heures après l'opération.

L'étendue de notre service qui, à l'époque où cette mort survint, absorbait textuellement toutes nos journées et souvent même nos nuits, ne nous permit pas de pratiquer l'ouverture du cadavre.



Ce cas est le seul où nous ayons eu à opérer avant l'arrêt définitif de la gangrène. L'insuccès de l'opération eut manifestement pour cause l'état général de l'économie, état déterminé peut-être en partie par le froid et en partie par l'infection que la gangrène locale répandit dans l'ensemble des organes. Il ne peut infirmer l'excellence de la doctrine précédemment émise. Combien ne pourrions nous pas lui opposer d'opérations heureuses pratiquées dans des circonstances localement analogues ou même à certains égards plus défavorables ? Telle est par exemple la désarticulation scapulo-humérale faite par M. Lawrence dans un cas de gangrène qui avait de proche en proche envahi tout le bras. « La peau du membre amputé, dit « l'auteur, était verdâtre et livide, mais l'épiderme « n'était pas détaché. Le tissu cellulaire distendu « par des gaz et contenant une sanie infecte avait « un aspect morbide là même où l'incision fut « pratiquée. De petites suffusions sanguines existaient çà et là sur le trajet des nerfs et jusqu'à la hauteur où l'amputation eut lieu. Les artères « n'étaient oblitérées sur aucun point. Toutes les « parties molles étaient teintées d'une couleur rouge « foncée et livide et un liquide écumeux, rougeâtre s'échappa pendant que le couteau en « opérait la section. Cette opération fut couronnée « de succès. »



*Congélation des deux pieds.—Réaction.—Apparition consécutive de marbrures brunâtres sur tous les orteils.*

M. le Chef d'escadron de V....., chef d'État-Major de la colonne expéditionnaire, est arrivé à Sétif le 4 janvier vers cinq heures du soir. Pendant la journée du 3 et la nuit du 3 au 4 il n'avait éprouvé d'autre sensation que celle de froid aux pieds. La journée du 3 s'était passée pour lui dans une marche continuelle (à pied) mais, dans la nuit qui suivit, il resta dans un repos absolu et sans s'approcher des feux. Le lendemain matin, quand il fallut se remettre en route, il lui fut très-difficile de marcher et cette difficulté lui sembla tenir plutôt à la fatigue qu'au froid. Il monta cependant à cheval et ne remit pied à terre qu'à Sétif. Son premier soin en arrivant fut de se changer et de mettre des chaussures chaudes et larges. Il s'assura en ce moment que ses pieds qui étaient insensibles et un peu gonflés avaient partout une coloration normale. Sur les huit à neuf heures du soir, au milieu de son dîner, une douleur très-violente s'empara de ses deux pieds. Il rentra chez lui et tels étaient sa fatigue et son besoin de sommeil que, malgré la souffrance qu'il éprouvait, il ne tarda pas à s'endormir. Au milieu de la nuit surcroît de



douleur qui le tient éveillé jusqu'au lendemain 3. Je le vois ce même jour dès le matin : les pieds sont rouges et gonflés jusqu'aux malléoles. Tous les orteils jusqu'au-delà des têtes des métatarsiens, et surtout les gros, sont marbrés d'une couleur bleue foncée presque noire. Une large phlyctène s'est formée sur le côté interne de chaque gros orteil. L'épiderme soulevé est ponctionné avec précaution, une sérosité jaunâtre limpide s'écoule. Les orteils sont légèrement oints d'huile camphrée. Les pieds et les jambes, préalablement frictionnés avec cette huile, sont ensuite enveloppés de flanelle. M. de V..... continue à satisfaire son appétit qui est bon.

Les mêmes prescriptions sont continuées jusqu'au 11 janvier, jour où le malade se met en route pour Constantine. Les changements jusqu'alors survenus du côté de ses pieds consistaient : 1° dans la disparition du gonflement et de la rougeur ; 2° dans une atténuation de la couleur bleue ou brunâtre des orteils à la circonférence des taches et marbrures. Bien qu'une neige épaisse couvrit encore la terre le voyage n'aggrave en rien la position de M. de V..... Le 16 janvier l'épiderme soulevé qui, sur les deux orteils, avait formé phlyctène se détache. Du côté gauche une nouvelle pellicule épidermoïde rose et délicate recouvre déjà le corps muqueux. Du côté droit, où une accumulation de sérosité purulente avait dû à plusieurs reprises être



vidée, les choses sont moins avancées; le corps muqueux, détruit sur quelques points, laisse apercevoir le chorion qui commence à bourgeonner. Les plaies sont pansées avec du cérat simple, les orteils et les pieds sont frictionnés avec de l'huile additionnée d'ammoniaque.

20 Janvier. Les marbrures bleuâtres ou brunâtres ont disparu des métatarsiens et sont bornées aux orteils. L'ongle du gros orteil droit se détache, les petites plaies sont en voie de guérison. Même pansement.

24 Janvier. Guérison des plaies et chute de l'ongle du gros orteil droit. Les extrémités des orteils, toujours noires, sont couvertes d'un épiderme épais et sec.

Vers le milieu du mois de Juin, c'est-à-dire après un intervalle de cinq mois, l'ongle du gros orteil droit tomba une seconde fois. Aujourd'hui 21 septembre, M. de V..... vague à toutes ses occupations; mais ses orteils sont sensibles à la pression et n'ont pas repris tout-à-fait leur coloration naturelle. Sous l'influence des changements de temps ses pieds deviennent douloureux; c'est aux orteils, et surtout à l'articulation metatarso-phalangienne du gros orteil droit, qu'il souffre le plus.

Cette observation nous semble offrir un grand intérêt sous le rapport de l'enchaînement des phénomènes morbides. Un froid intense est ressenti



aux deux pieds, il exerce d'abord sur les nerfs de la partie son action hyposthénisante et détermine l'insensibilité. Puis le sujet est placé dans une température ambiante assez élevée, il a fait usage de chaussures chaudes et sèches et des phénomènes de réaction apparaissent. Des douleurs violentes se font sentir qui doivent être sans doute attribuées à un brusque retour de stimulation vitale dans les nerfs hyposthénisés. Consécutivement se montrent sur les orteils des marbrures ecchymotiques qui, de leur côté, semblent un résultat de la dilatation mécanique opérée par la chaleur sur le sang en stagnation dans les capillaires. Ici donc hyposthénie sous l'influence du froid et réaction donnant lieu à des phénomènes vitaux d'abord, à une action mécanique plus tard.

*Congélation de tous les orteils. — Réaction spontanée.*  
*— Retour de la sensibilité et de la chaleur dans*  
*cinq orteils neuf jours après la réaction. — Gan-*  
*grène des cinq autres orteils à la même époque.*

M. le chef d'escadron H..., commandant du Train des équipages militaires a marché presque constamment à pied pendant les journées du 3 et du 4 janvier. Il a peu souffert du froid. Son alimentation durant les deux dernières journées s'est bornée à un très-petit morceau de pain, au quart



d'un biscuit et à une gorgée de vin. Arrivé à Sétif le 4, à six heures du soir, il a pris un potage et a parcouru toute la ville sans éprouver autre chose qu'un peu de fatigue. Dans cette promenade il lui est arrivé quelquefois d'avoir les pieds dans de la neige fondante et aussitôt une sensation bien franche de froid l'en a averti. Il n'y avait donc pas encore insensibilité. M. le commandant H..... se coucha vers huit heures, après avoir dîné. En se mettant au lit il reconnut que ses pieds étaient froids et d'un rouge bleuâtre jusqu'au-dessus des malléoles et que leurs orteils étaient marbrés de bleu foncé. Pas de douleur, léger gonflement, sensibilité un peu diminuée. Le sommeil vint promptement mais il fut bientôt interrompu par une douleur vive dans les deux pieds.

Le 5 Janvier. Les pieds sont gonflés, rouges et chauds; les orteils, et principalement les gros, sont marbrés d'une couleur bleue foncée qui s'étend au-delà des têtes metatarsiennes. L'épiderme est intact, point de phlyctènes. L'état général est bon. M. Moreau, Médecin en chef de l'hôpital militaire de Sétif, est appelé à donner ses soins au malade. Il prescrit un régime sévère (deux potages par jour) et, sur les pieds, des onctions d'huile camphrée.

Aucun changement important n'a lieu jusqu'au 14 janvier. A cette époque les trois derniers orteils



du pied gauche ont recouvré leur couleur normale et leur sensibilité mais les parties molles qui recouvrent les phalanges des deux premiers orteils droits et des trois premiers orteils gauches commencent à se flétrir et sont d'une couleur presque noire. Le même régime et les mêmes pansements sont continués.

20 Janvier. Les phalanges désignées sont sphacélées, on les enlève. Application de cataplasmes sur les pieds pour détacher des lambeaux d'escharres qui tiennent encore.

28. Affaiblissement progressif. Extension du sphacèle dont la limite dépasse les deux premières têtes metatarsiennes au pied droit et au pied gauche. Le moral du malade est excellent. La résection des deux premières têtes metatarsiennes et l'amputation du troisième orteil sont pratiquées sur le pied gauche. On réunit par première intention, même régime.

29. Résection des deux premières têtes metatarsiennes du côté droit. Réunion par première intention.

8 Février. La réunion par première intention n'a point été obtenue. Les plaies qui avaient été d'abord vermeilles et d'un bel aspect deviennent blafardes et fournissent une suppuration séreuse. Les parties molles se retirent et laissent à nu les extrémités réséquées du premier metatarsien



droit et du premier metatarsien gauche. Cette dénudation entraîne une nécrose qui force à recourir à une nouvelle résection du premier métatarsien gauche. Les forces s'épuisent. Dépérissement chaque jour plus marqué. Diarrhée. Le moral du malade est inébranlable. On tente de nouveau la réunion par première intention. Dans les jours qui suivent la diarrhée disparaît et le régime est modifié, on accorde, en petite quantité, du poulet et du vin de Bordeaux. Cependant plusieurs foyers purulents se forment sur les faces dorsale et plantaire des deux pieds. L'articulation métatarso-phalangienne du quatrième orteil gauche est ouverte et baigne dans le pus. De la tuméfaction survient. Le malade mesure la gravité de sa position et se décide à se faire transporter à Constantine. Il part le 25 février et arrive dans cette ville le 26. Son état général s'est peut-être amélioré pendant la route, mais ses pieds sont dans le même état. Il se remet entre les mains de MM. Vital, Médecin en chef de l'Hôpital militaire et Tesson Chirurgien aide-major du corps qu'il commande. Un régime tonique composé de consommés, de viandes roties et de vin de Bordeaux lui est prescrit; ses plaies sont pansées avec de l'onguent styrax. Sous l'influence de cette alimentation et de ce topique stimulant l'état général se relève, la suppuration devient moins abondante et plus épaisse. Les plaies perdent leur aspect



blafard et fongueux et deviennent de jour en jour plus vermeilles, enfin la cicatrisation commence et est achevée complètement le 6 mai. Pendant ces deux derniers mois plusieurs fragments nécrosés avaient été extraits. Deux articulations metatarso-phalangiennes ouvertes s'étaient soudées. Des foyers formés à la face plantaire et à la face dorsale des deux pieds avaient été vidés et avaient guéri. Aujourd'hui 21 Septembre M. le commandant H... est parfaitement rétabli et remplit ses fonctions dans ce qu'elles ont de plus pénible et de plus fatigant. Il ne lui reste que la gêne inséparable de la mutilation qu'il a subie.

Chez M. le Commandant H... une asphyxie partielle avait été produite par le froid. La réaction survint et parut d'abord n'exercer sur les parties asphyxiées aucune action soit nuisible soit avantageuse. Cependant au bout de neuf jours les phalanges des deux premiers orteils droits et des trois premiers orteils gauches sont frappées de gangrène. Au contraire les trois derniers orteils droits et les deux derniers orteils gauches ont recouvré leur sensibilité et leur coloration naturelle. Ce cas offre donc tout à la fois un exemple de réaction ayant ranimé la vie dans des parties où la gangrène était imminente et un exemple de gangrène survenue malgré le mouvement réactionnaire.

Cette manière d'envisager les faits et de les



exprimer est en opposition, nous ne l'ignorons pas, avec les idées généralement reçues. Tandis que pour nous la réaction naturelle, spontanée et que l'application intempestive de la chaleur n'a pas provoquée est un phénomène éminemment salutaire, pour la plupart de pathologistes, qu'elle soit spontanée ou non, elle est au contraire le phénomène auquel tous les accidents qui surviennent à la suite des congélations doivent être attribués. Cette proposition exige quelques développements. Si le médecin avait à traiter des congélations ou asphyxies partielles au moment même où elles viennent de se produire, il y aurait sans aucun doute quelque chose de mieux à faire que d'attendre une réaction; ce serait, comme nous l'avons déjà dit, de frictionner d'abord les parties malades avec de la neige ou de la glace pilée et de les plonger ensuite dans de l'eau très-froide dont la température serait successivement élevée. Ainsi on rétablirait les tissus dans leurs conditions normales sans secousse, sans réaction et la maladie serait en quelque sorte remplacée immédiatement par la santé. Mais dans l'immense majorité des cas il n'en est pas ainsi. Le malade trouve d'abord son indisposition légère et l'abandonne à elle-même en comptant sur une guérison prochaine. Or cette insouciance a nécessairement l'un ou l'autre des résultats suivants: ou bien la réaction n'a pas lieu dans les parties asphyxiées et



la vie, après y avoir été suspendue pendant un temps plus ou moins long, finit par s'éteindre; d'où gangrène qui, en absence de tout mouvement limitateur, grandit d'instant en instant; c'est là la chance la plus fâcheuse. Ou bien la réaction a lieu. Celle-ci se manifeste par deux ordres de phénomènes: 1<sup>o</sup> Retour de la sensibilité qui peut être exagérée jusqu'au degré de la douleur, rétablissement des actions moléculaires, de la nutrition et de la chaleur, phénomènes vitaux évidemment utiles alors même que, dans les tissus congelés, certaines parties auraient subi une altération trop profonde pour que la vie s'y exerce encore puisque la limite qu'ils imposeraient à ces parties empêcherait la gangrène de s'étendre. 2<sup>o</sup> Sous l'influence du rétablissement de la vie et de la chaleur: dilatation des liquides stagnants dans les trames organiques; mouvement plus ou moins rapide du sang au milieu des tissus dont les capillaires sont obstrués; rupture possible de capillaires d'où extravasation sanguine et dilacérations; phénomènes mécaniques qui, lorsque la réaction a été provoquée par l'application d'une chaleur artificielle et s'est développée avec violence, peuvent entraîner les plus graves désordres mais qui, dans les cas où la réaction a été modérée (et elle l'est presque toujours quand elle survient spontanément), donnent lieu le plus souvent à des lésions insignifiantes telles



que des marbrures livides superficielles, des ecchymoses peu étendues et quelquefois même ne produisent aucun effet appréciable.

Le cas de M. le commandant H... confirme tout-à-fait le rôle que nous faisons jouer à la réaction. Chez lui les trois derniers orteils droits et les deux derniers orteils gauches, malgré l'asphyxie qu'ils présentaient et la réaction intense qui eut lieu, recouvrèrent leur sensibilité et toutes leurs conditions normales sans avoir essuyé le moindre accident. Les deux premiers orteils droits et les trois premiers orteils gauches furent, à la vérité, frappés de gangrène mais nous maintenons qu'ils le furent malgré la réaction et non à cause de la réaction. En effet, d'une part, celle-ci n'y avait produit aucun changement appréciable, n'y avait rendu les marbrures ni plus étendues ni plus foncées; d'autre part, ce n'est que neuf jours après son apparition que la gangrène commença à se dessiner; double motif qui nous force à conclure que les phénomènes mécaniques de la réaction n'entrèrent pour rien dans cette gangrène et que la lésion vitale primitive des tissus, l'hyposthénie nerveuse directe en fut l'unique cause.

*Effets généraux du froid.* Le froid ne se borne pas toujours à produire des congélations partielles



il peut encore atteindre l'ensemble de l'économie et donner naissance à des phénomènes d'un ordre particulier. Si les sujets qu'il a frappés sont jeunes et vigoureux, l'action hyposthénisante qu'il exerce de prime abord est bientôt remplacée par une réaction qu'indiquent la plénitude et la fréquence du pouls, l'ampleur de la respiration, l'élévation de la température de la peau et une certaine alacrité. Cette réaction, d'après quelques observateurs, pourrait aller assez loin pour déterminer des congestions et des hémorrhagies du côté du cerveau, des poumons et d'autres organes. Il paraît que dans la retraite de Russie elle a fait mourir ainsi un certain nombre de militaires. Nous devons dire que pendant notre expédition du Bou-Thaleb nous n'avons pas eu occasion de l'observer une seule fois à ce degré. Quoiqu'il en soit, le froid continuant à agir, les individus qui ont offert cette réaction ne tardent pas à se trouver dans la même situation que les sujets plus faibles chez lesquels elle n'a pas été observée. Tous les effets de l'hyposthénie générale se présentent : rareté de la respiration ; petitesse et lenteur du pouls ; abaissement de la température tant à l'extérieur qu'à l'intérieur ; couleur violacée de la peau, des lèvres et de la langue due au séjour du sang veineux dans les capillaires et qui annonce l'insuffisance de l'hématose et le ralentissement de la circulation ;



affaiblissement des forces musculaires ; trouble des fonctions des organes des sens , inactivité de l'intelligence ; affaissement ; tendance au sommeil. Pour les sujets arrivés à ce point et qui ne peuvent être ni soustraits à l'influence du froid , ni traités avec les soins que leur état réclame , la mort est inévitable. Elle a lieu par suite de la suspension de plus en plus complète des actions organiques.

On s'est demandé pendant combien de temps cette suspension , lorsqu'elle était arrivée assez loin pour produire un état de mort apparente , pouvait se prolonger sans entraîner l'extinction de la vie. Cette question qui intéresse au plus haut degré le médecin praticien a été traitée généralement d'un point de vue spéculatif et a donné lieu à des solutions très-diverses. Les auteurs qui s'en sont occupés nous paraissent avoir assimilé les accidents qui suivent l'action d'un froid intense et prolongé à ceux que détermine l'arrêt mécanique de la respiration et avoir conclu par comparaison. Ainsi par cela même qu'on cite un certain nombre d'exemples où des individus submergés depuis plusieurs heures , depuis un jour , deux jours , trois jours et plus ont néanmoins survécu (Haller, grande physiologie, tome 3), les auteurs dont nous parlons ont été conduits à admettre que la mort apparente produite par le froid pouvait se prolonger pendant le même temps avant d'être suivie de la mort réelle.



Sans entrer dans l'examen des faits qui ont été pris comme terme de comparaison et que Haller considère lui-même, pour la plupart, comme peu dignes de foi, nous ferons observer que les deux états ainsi assimilés sont loin d'être identiques. Dans l'un et l'autre, à la vérité, il y a absence de respiration, arrêt au moins apparent de la circulation, mort apparente, en un mot asphyxie. Mais d'un côté tous les accidents dépendent du séjour de l'individu dans un milieu privé d'air, de la non-oxygénation du sang et de l'arrivée aux organes d'un liquide veineux qui n'a rien de vivifiant ni de réparateur; de l'autre ils sont dus à une atteinte directement portée au système nerveux; atteinte en vertu de laquelle le sang veineux des poumons et l'air inspiré, bien qu'en présence, ne donnent plus lieu aux actions chimiques d'où dérive l'hématose; atteinte en vertu de laquelle les muscles inspireurs, frappés de paralysie, cessent bientôt d'accomplir l'acte mécanique de la respiration. Ainsi tandis que dans l'asphyxie par submersion, le système nerveux n'est enrayé dans son action que par l'absence du sang artériel, dans l'asphyxie par le froid il est enrayé par une double cause: 1<sup>o</sup> action du froid lui-même qui l'a hyposthénisé profondément et a été le point de départ de tous les accidents; 2<sup>o</sup> absence de sang artériel qui a été la conséquence de l'hyposthénie précédente. Il est donc



évident que cette seconde asphyxie s'accompagne d'une lésion plus grave, plus immédiatement dangereuse et qu'elle doit amener plus rapidement la mort réelle.

A cette manière de voir on opposera sans doute l'exemple des 20 prisonniers autrichiens qui, perdus pendant vingt-six heures dans les neiges du Mont-Cenis, furent retrouvés dans un état de mort apparente et purent cependant être rappelés à la vie; celui rapporté par Pilhes (Journal de Roux, tome 17) d'un forgeron qui resta pendant quatre jours enseveli dans la neige et qui se réveilla le cinquième; celui de Reeve relatif à une femme qui resta huit jours enfouie dans la neige, à six pieds de profondeur, et qui fut retrouvée vivante. Nous répondrons que chez ces divers individus, dans notre opinion, la mort apparente ne survint que peu d'instants avant le moment où un hasard heureux les fit découvrir; que suivant toute probabilité ils durent la conservation de leur existence, pendant un temps aussi long, à la couche de neige solide qui les recouvrait et qui, en vertu de son peu de conductibilité, maintint les organes, pendant les premières heures ou les premiers jours, à un degré de température qui interdisait les phénomènes de la mort apparente.

Les opinions de John Hunter sur la question qui nous occupe sont trop curieuses, les expériences



qui les lui firent abandonner sont trop intéressantes et trop dignes de méditation pour qu'elles ne se placent pas naturellement sous notre plume en ce moment. D'ailleurs ces opinions et les arguments dont l'illustre physiologiste les appuyait, malgré l'erreur qui les entache, semblent de nouveau vouloir s'introduire dans la science ; quelques articles assez récemment publiés sur les effets du froid et sur les congélations, sans leur donner l'extension qui en rend l'absurdité palpable, en reproduisent néanmoins la substance. C'est pour nous un motif de plus de les soumettre à l'examen. Hunter avait pensé que la congélation, en suspendant toute action moléculaire et en empêchant par conséquent les déperditions de substance et les altérations ultérieures dans les tissus, pourrait amener un état de mort apparente qu'on prolongerait aussi longtemps qu'on voudrait et qu'on ferait cesser facilement par le dégel. L'homme, disait-il, qui voudrait passer les dix dernières années de sa vie dans ces alternatives de mort apparente et de vie active prolongerait certainement son existence de mille ans et, en se faisant dégeler tous les cent ans, se mettrait au courant des progrès accomplis pendant son sommeil séculaire. Il nous apprend lui-même l'étendue de ses convictions à ce sujet par ces mots : « Comme tous les faiseurs de projets je comptais sur celui-là pour faire ma fortune. » L'expérience



suivante qu'il fit pendant l'hiver de 1766 pour vérifier un autre principe de la vie animale le désabusa. Deux carpes furent placées dans un vase en verre rempli d'eau commune de rivière, puis le vase fut mis dans un mélange réfrigérant. L'eau qui touchait à la paroi du vase se gela rapidement et la congélation de proche en proche se dirigea vers les poissons; mais arrivée à une certaine distance elle resta stationnaire. Hunter alors pour hâter la solidification de l'eau restée liquide y jeta assez de neige pour la rendre épaisse. La neige fondit autour de chaque carpe. Une nouvelle quantité de neige introduite dans le vase fut également liquéfiée. Enfin, après plusieurs tentatives inutiles pour amener avec de la neige la congélation de l'eau, les carpes furent abandonnées à elles-mêmes. Pendant assez longtemps celles-ci luttèrent contre la double influence du mélange réfrigérant et du froid atmosphérique. Mais, après avoir épuisé toutes leurs forces vitales à produire de la chaleur, elles finirent par se geler. Alors on les fit dégeler avec toutes les précautions nécessaires, c'est-à-dire en faisant passer le vase qui les contenait par une série de températures de moins en moins froides. Elles reprirent leur souplesse mais non leur action en sorte, dit Hunter, qu'elles étaient réellement mortes.

Le froid, par l'influence hyposthénisante qu'il



exerce sur le système nerveux, par l'épuisement des forces vitales qu'il détermine, peut donc amener non seulement la suspension des phénomènes de la vie mais aussi, si son action est assez profonde ou assez prolongée, leur arrêt définitif c'est-à-dire la mort réelle. Et cette vérité ne s'applique pas seulement à l'ensemble de l'économie, à la vie générale de l'individu; elle est rigoureusement applicable encore à un organe pris en particulier, au pied, à la main et à la vie de chacune de ces parties. Il est donc inexact de dire avec quelques auteurs que les tissus où le froid a suspendu l'action organique, par cela qu'ils n'éprouvent aucun changement notable de texture, peuvent demeurer fort longtemps dans un état de mort apparente sans perdre irrévocablement la vie. Il est inexact de considérer la suspension des mouvements moléculaires et l'impossibilité des altérations anatomiques comme une condition toute puissante qui assure pendant longtemps le maintien de la vie. Il est inexact surtout d'avancer en termes généraux que, dans les congélations partielles, les dommages dépendent moins du froid en lui-même que des changements qui s'opèrent, lorsqu'il vient à cesser, dans les tissus jusques-là engourdis. Nous avons déjà dit et nous répétons que le froid lui-même, quand il est intense et prolongé, quand les sujets sont faibles ou valétudinaires, peut arrêter



directement la vie dans les tissus ; que les dommages qui se produisent dans les parties congelées, au moment où le froid cesse, sont le résultat des phénomènes mécaniques de la réaction et ont généralement, sauf les cas d'application imprudente de calorique, moins de gravité qu'on ne le suppose.

Nous ne pouvons abandonner ce sujet sans protester contre l'explication mécanique donnée, il y a dix ans environ, de l'asphyxie soit générale, soit partielle que détermine le froid. Partant de ce fait démontré que, sous l'influence d'un abaissement de température, les liquides qui se meuvent dans les tubes capillaires éprouvent dans leur cours un notable ralentissement plusieurs physiologistes et M. Poiseuille le premier, si notre mémoire est fidèle, ont pensé que le froid devait ralentir la marche du sang dans les capillaires périphériques et de proche en proche dans tous les organes. Cette induction assez peu probable en elle-même a été étayée d'expériences qui lui donnent une certaine apparence de rigueur. On prétend avoir constaté que la membrane interne des vaisseaux est tapissée d'un liquide dont la couche devient de plus en plus épaisse à mesure que la température devient plus basse, liquide par conséquent qui fait à la marche du sang un obstacle d'autant plus prononcé que le froid est lui-même plus intense. Je ferai remarquer 1<sup>o</sup> que l'existence de ce liquide, si elle est réelle,



met un grand intervalle entre les deux phénomènes que l'on avait prétendu rapprocher. Ce n'est certes pas en déterminant le dépôt d'une humeur particulière dans les tubes capillaires que le froid y ralentit le cours des liquides; 2° que si la présence d'une humeur, à l'intérieur des vaisseaux, est le véritable motif du ralentissement puis de la suspension de la circulation dans les parties soumises au froid, on ne s'explique plus pourquoi ce ralentissement et cette suspension surviennent si rapidement chez les hommes lymphatiques, malingres, appauvris par les maladies, privés d'aliments; pourquoi au contraire ils surviennent si lentement chez les hommes bien portants, énergiques, suffisamment alimentés. L'opinion que nous attaquons n'aurait de valeur qu'autant qu'on aurait d'abord prouvé incontestablement l'existence, à l'intérieur des vaisseaux, d'un liquide devenant de plus en plus abondant à mesure que le froid augmente; qu'autant qu'on aurait ensuite démontré que la sécrétion de ce liquide est favorisée par la débilité générale, l'abstinence forcée, la fatigue, l'état de maladie. Jusques-là elle devra être repoussée.

En résumé pour nous l'action du froid s'exerce d'abord sur le système nerveux. Au plus haut degré elle arrête définitivement la vie soit dans une partie, soit dans l'ensemble de l'économie. A un degré plus faible elle peut altérer la vitalité des



tissus de manière à préparer, pour un temps plus ou moins rapproché, des gangrènes consécutives. C'est l'atteinte portée au système nerveux qui est le point de départ de tous les phénomènes morbides dont le froid est suivi. Quand le froid a déterminé la suspension des actions organiques et l'état de mort apparente, sans préciser le temps pendant lequel celle-ci peut se maintenir, nous croyons que la mort réelle ne peut tarder.

Les discussions auxquelles nous nous sommes livré, tant à propos des effets locaux qu'à propos des effets généraux du froid, indiquent suffisamment la ligne que nous aurions suivie si nous avions été à même de traiter des hommes atteints dans leur économie entière par cet agent 1° dans le cas de mort apparente : frictions avec de la neige, élévation lente et graduée de la température du milieu, insufflation d'air dans les poumons, excitants portés sur la muqueuse pituitaire, sur le tube digestif; 2° dans les cas d'engourdissement : frictions sur tout le corps avec de la flanelle, vêtement de laine sèche ou transport dans un lit dont les draps seraient remplacés par des couvertures de laine, puis boissons chaudes. Il ne faut point au reste confondre l'engourdissement dont il s'agit ici avec le froid plus ou moins général mais superficiel qu'on a fréquemment l'occasion d'observer et qu'on peut dissiper immédiatement et sans inconvénient par l'emploi du



calorique, les briques chaudes aux pieds, les boissons chaudes, etc.; 3<sup>o</sup> si les sujets offraient les symptômes d'une réaction trop forte il faudrait sans doute la calmer par des moyens en rapport avec son intensité: bains frais, repos, diète ou peut-être même une saignée modérée, etc. Mais je le répète, ce cas ne s'est pas présenté à mon observation.

Nous terminerons ce chapitre par les propositions suivantes qui sont tout à la fois le résumé et le complément des opinions développées dans les pages précédentes :

I. Les effets du froid sur l'économie animale sont bien moins en rapport avec l'intensité de cet agent qu'avec le mode d'être et de sentir des individus.

II. A degré égal le froid humide entraîne beaucoup plus rapidement des effets pathologiques que le froid sec.

III. Les asphyxies générales ou partielles sont déterminées d'autant plus promptement par le froid que les sujets présentent une ou plusieurs des conditions suivantes : Constitution lymphatique ou bien altérée par les excès et les maladies — Abstinence prolongée — Excès de fatigue — Privation de sommeil — Ivresse actuelle — Affections chroniques — Fièvres et dyssenteries.

IV. Les asphyxies locales se rencontrent principalement sur les parties les plus éloignées des centres



nerveux et circulatoire; sur celles qui sont habituellement découvertes telles que le visage et les mains; sur celles où le tissu adipeux est rare et où les nerfs et les vaisseaux ont une position très-superficielle.

V. Le froid à un certain degré pâlit les tissus, les ride et y amène un engourdissement plus ou moins prononcé. Ces phénomènes dépendent de l'action hyposthénisante portée directement sur les nerfs de la partie et du ralentissement que la circulation capillaire y éprouve consécutivement.

VI. Cette période de retrait, si les secours de l'art étaient réclamés à temps, serait toujours combattue facilement par la simple précaution d'élever graduellement et prudemment la température de la partie asphyxiée. Il n'y aurait jamais alors ni réaction, soit légère soit intense, ni gangrène.

VII. Mais, dans l'immense majorité des cas, les malades n'ont recours au médecin qu'au bout de plusieurs jours, soit après l'établissement de la réaction, soit après l'apparition d'une gangrène.

VIII. La réaction peut être provoquée par des moyens artificiels, l'usage du feu.... Elle peut survenir en quelque sorte spontanément par le simple passage du milieu froid où l'asphyxie a été contractée à un autre milieu plus chaud de quelques degrés.

IX. Dans l'un comme dans l'autre cas elle donne



lieu à deux ordres de phénomènes 1° phénomènes vitaux qui se développent les premiers et sont indiqués par des douleurs vives, une sensation de brûlure 2° phénomènes mécaniques qui dépendent de la brusque dilatation des liquides et du rétablissement trop prompt de la circulation dans des parties où les capillaires sont obstrués.

X. Les réactions provoquées artificiellement et celles développées spontanément diffèrent très-notablement par le degré. Les premières dépassent le plus ordinairement toutes les limites et donnent lieu à des inflammations intenses, à des désorganisations profondes des tissus. Les secondes sont presque toujours sans danger. A peine élèvent-elles la chaleur de la peau et produisent-elles dans les tissus quelques extravasations sanguines insignifiantes. Quelquefois elles ramènent aux conditions normales des tissus menacés de gangrène. Dans tous les cas où la gangrène est inévitable elles en bornent le plus ordinairement les limites et l'étendue.

XI. Les réactions, suivant le degré qu'elles atteignent, déterminent dans les tissus des effets comparables à ceux de la brûlure: érythème simple, formation de phlyctènes, altération et destruction du corps muqueux, destruction du chorion, destruction des tissus sous-cutanés des muscles, etc.

XII. Chez les individus valétudinaires ou dont la constitution est profondément altérée la réaction



peut ne pas s'opérer, bien que la température du milieu soit devenue tout-à-coup plus douce ou même que les parties asphyxiées aient été soumises à une chaleur artificielle. Le froid alors, à côté des asphyxies partielles, a porté atteinte à tout l'organisme.

XIII. Quand les sujets atteints d'asphyxie partielle restent exposés à un froid non interrompu la réaction n'a pas lieu. Pendant un temps variable et qui peut être assez long le tissu asphyxié jouit encore d'une vie obscure mais celle-ci finit enfin par s'éteindre et la gangrène se déclare.

XIV. Les gangrènes ainsi formées varient en profondeur et, au moment de la chute des escharres, donnent elles-mêmes lieu à des lésions comparables à quelques-uns des degrés de la brûlure. Elles peuvent n'avoir détruit que le corps muqueux (3<sup>e</sup> degré de la brûlure) ou le chorion (4<sup>e</sup> degré) ou le tissu cellulaire sous-dermoïde et les muscles (5<sup>e</sup> degré). Elles peuvent avoir amené des dénudations d'os et des nécroses (6<sup>e</sup> degré).

XV. Le froid s'exerçant de l'extérieur à l'intérieur a une action d'autant plus intense que les tissus sont plus superficiels, d'autant plus faible que les tissus sont plus profonds. De là des degrés dans l'atteinte qu'il leur porte. Tandis qu'il frappe de mort les premiers il peut n'entraîner dans les seconds qu'une altération de vitalité qui souvent ne se manifeste



d'abord par aucun phénomène apparent, mais qui donne inévitablement lieu à des plaies de mauvaise nature et quelquefois à des gangrènes consécutives.

XVI. Dans les cas de gangrène partielle qui ne se compliquent pas d'une dépression profonde des forces et où la réaction s'est opérée naturellement, l'état général ne fournit aucune indication particulière ;

XVII. Alors même cependant il est indispensable d'accorder aux malades une alimentation substantielle et réparatrice si l'on ne veut pas voir, à la chute des escharres, les plaies devenir fongueuses et nécessiter souvent trois et quatre opérations sur des points successivement plus élevés ;

XVIII. Alors, s'il arrivait que la gangrène locale s'étendit incessamment et de manière à faire craindre l'envahissement de tout un membre et du tronc, il y aurait lieu à opérer sans attendre qu'elle se limite.

XIX. Quand les gangrènes partielles coexistent avec une dépression profonde et non interrompue des forces l'état général fournit des indications très-importantes ;

XX. Il exige l'emploi des stimulants : alcooliques,



vin de cannelle composé, cannelle sous toutes les formes, frictions et aliments dans la mesure où ils peuvent être supportés par l'estomac ;

XXI. Il impose, à moins que le traitement général n'ait réussi à opérer une réaction, la pénible obligation de laisser marcher la gangrène locale et de s'abstenir de toute opération.

XXII. Les propositions qui précèdent et qui sont relatives aux effets locaux du froid s'appliquent en grande partie aux effets généraux de cet agent.

Dans les asphyxies générales comme dans les asphyxies partielles le froid a commencé par porter son action sur le système nerveux.

XXIII. Au moment où une asphyxie générale est produite les secours de l'art, s'ils pouvaient s'exercer dans toute leur plénitude, feraient aussi cesser facilement tous les accidents ; mais dans les expéditions militaires, dans les marches à travers un pays désert, dans tous les cas où des circonstances impérieuses forcent les troupes à avancer rapidement l'administration de ces secours est impossible et la mort survient sur place sans que la réaction ait pu se manifester.

XXIV. Il y a cependant entre les asphyxies partielles et les asphyxies générales une différence assez notable. Tandis que dans celles-là les tissus conservent pendant assez longtemps une vie obscure qui les préserve de la gangrène celles-ci, quand elles



sont arrivées au point de produire la mort apparente, amènent au contraire promptement l'extinction de la vie.

XXV. Si les sujets dont l'économie toute entière a ressenti les effets du froid pouvaient être soustraits en temps convenable à l'influence de cet agent on verrait se produire des phénomènes analogues à ceux des asphyxies partielles, phénomènes qui entraîneraient les mêmes indications.

XXVI. L'emploi de la neige à la suite des asphyxies générales ou locales déterminées par le froid ne peut être utile qu'en certaines circonstances dont nous n'avons trouvé l'indication chez aucun auteur.

XXVII. Il n'y faut recourir que si la température ambiante est d'un certain nombre de degrés au-dessous de zéro. La neige qui se fond dans l'acte même de la friction ayant une température égale à zéro devient alors un moyen très-convenable d'élever la chaleur de l'individu asphyxié. Elle forme, en quelque sorte, le premier terme de la série de températures successivement graduées par lesquelles il est indispensable de faire passer le sujet si l'on veut éviter de dangereuses réactions.

XXVIII. Si, par suite d'une abstinence prolongée ou de fatigues excessives ayant épuisé les forces ou bien encore d'une faiblesse particulière à quelques



individus, les phénomènes asphyxiques apparaissent bien que la température fut un peu supérieure à zéro, ce ne serait pas par de la neige fondante qu'il faudrait commencer à relever la chaleur du malade mais bien par des lotions aqueuses ou des bains d'une température un peu plus élevée que celle du milieu ambiant (1).

XXIX. Quoiqu'il puisse paraître impossible de voir l'asphyxie survenir sous une température supérieure à zéro, ce que nous avons vu durant l'expédition de Bou-Thaleb nous oblige à admettre ce fait comme incontestable.

XXX. Quand les asphyxies partielles surviennent sous une température inférieure à zéro les frictions avec de la neige sont toujours utiles, mais tandis que chez les sujets robustes et dispos elles peuvent, à elles seules, faire cesser les accidents, chez les individus plus faibles l'action favorable qu'elles ont d'abord eue a besoin d'être continuée par l'application de topiques de moins en moins froids.

XXXI. Dans tous les cas d'asphyxie c'est avant l'établissement du mouvement réactionnaire qu'il convient d'employer les transitions graduées de température en procédant du froid au chaud. Alors

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(1) Ceci suppose que les secours sont administrés sur le lieu même où l'asphyxie a été contractée. Il est évident que si le sujet avait été transporté dans un lieu abrité et chaud relativement, ces propositions ne seraient plus applicables.



que la réaction s'est établie, le médecin n'a plus qu'à surveiller celle-ci tant qu'elle ne dépasse pas certaines limites et à la combattre si elle va trop loin.



## OPÉRATIONS

PRATIQUÉES A L'HÔPITAL MILITAIRE DE SÉTIF.

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Les opérations que nous avons été dans l'obligation de pratiquer à l'Hôpital militaire de Sétif sont de deux sortes. Les unes ont été nécessitées par des gangrènes succédant à des asphyxies locales contractées dans les neiges du Bou-Thaleb; les autres ont eu pour motifs des plaies d'armes à feu reçues à une époque postérieure, dans les combats livrés par MM. le lieutenant-colonel Dumontet et le colonel Eynard aux kabyles du Guergour. Le tableau suivant indique le nombre et la nature de ces opérations.

|  |    |
|--|----|
| Amputation des phalanges des doigts..        | 2  |
| Amputation de plusieurs doigts.. . . .       | 1  |
| Amputation du bras (coups de feu).. .        | 2  |
| Id. scapulo-humérale (coup de feu) . . . . . | 1  |
| Amputation des phalanges des orteils.        | 13 |
| Id. d'un seul orteil . . . . .               | 11 |
| Id. de plusieurs orteils. . . . .            | 6  |
| Id. de tous les orteils. . . . .             | 3  |
| Résection des métatarsiens. . . . .          | 3  |



|  |   |
|--|---|
| Amputation d'une jambe. . . . .                          | 1 |
| Id. des deux jambes. . . . .                             | 1 |
| Id. de la cuisse (dont une pour<br>coup de feu). . . . . | 2 |

Ces opérations ont été pratiquées sur 38 individus; 1<sup>o</sup> au nombre de 42 pour gangrènes consécutives à des asphyxies partielles, c'est-à-dire que dans quelques cas le même sujet eut à en subir plusieurs. Deux d'entre elles ont été suivies de décès savoir à la suite d'une amputation de cuisse (1), à la suite d'une amputation du gros orteil. 2<sup>o</sup> au nombre de quatre pour plaies d'armes à feu; toutes ont guéri.

Notre intention n'est pas de rapporter les observations particulières des trente-huit opérés nous choisirons seulement parmi elles celles qui nous paraissent offrir le plus d'intérêt.

*Amputation des doigts médius et annulaire, de la phalangette de l'index et des deux dernières phalanges du petit doigt.*

L.... du 61<sup>e</sup>, à la suite d'une asphyxie partielle déterminée par le froid, a vu les parties molles qui recouvrent la face unguéale des doigts médius et annulaire, de la dernière phalange de l'index et des deux dernières phalanges du petit doigt (main gauche) frappées de gangrène. La chute des

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(1) Voyez l'observation de F.... fourrier au 3<sup>e</sup> bataillon d'infanterie légère d'Afrique, page 88.



escharres montre les tendons extenseurs altérés et les phalanges elles-mêmes, mises à nu dans toute leur longueur, atteintes d'une nécrose profonde. Les tissus de la face palmaire de ces phalanges n'avaient que peu souffert et promettaient des lambeaux convenables. L'opération fut résolue. J'y eus recours le 17 janvier en employant le seul procédé que l'altération des parties molles permit. Les doigts médius et annulaire furent amputés les premiers. La main étant étendue ces deux doigts furent fléchis modérément et, tandis qu'un aide retirait la peau en arrière, le tranchant du bistouri appliqué à deux lignes au-dessous des metacarpiens incisa la peau, les tendons extenseurs et mit à nu la face postérieure des articulations. Celles-ci furent traversées et leurs ligaments antérieurs ayant été divisés, nous taillâmes, sans changer de bistouri, un lambeau palmaire. Les tendons fléchisseurs furent ensuite excisés au niveau de l'articulation afin d'éviter leur procidence et la compression de l'artère brachiale rendant toute hémorrhagie impossible nous passâmes à l'amputation de la phalangette de l'index. Cette phalangette étant fléchie j'appliquai le tranchant du bistouri sur la saillie articulaire, divisai du même coup la peau et la partie postérieure de la capsule, puis, après avoir incisé à droite et à gauche les ligaments latéraux, pénétrai dans l'articulation et terminai en taillant un lambeau pal-



maire. Le même procédé fut aussitôt après appliqué à la phalange du petit doigt. Aucune artériole ne fut liée. Les plaies furent réunies par première intention à l'aide de bandelettes. Dès le surlendemain le sujet reçut la permission de se promener et fut mis à la demi-portion d'aliments. La réunion par première intention ne fut point obtenue. Les lambeaux palmaires nous donnèrent pendant quelques temps des inquiétudes mais sous l'influence d'une alimentation plus substantielle (le sujet était passé aux trois quarts de la portion et avait été mis à l'usage du vin de cannelle composé) et de pansements avec un digestif animé, ils commencèrent à bourgeonner et le vingt-deuxième jour après l'opération la cicatrisation était complète. La phalange de l'index jouissait dès lors du mouvement de flexion à cause sans doute de la conservation du tendon phalanginien du fléchisseur superficiel, mais la phalange du petit doigt était immobile et, malgré l'assertion de M. Velpeau, nous pûmes craindre pendant un certain temps de voir cette immobilité déjà signalée par Lassus se maintenir permanente. Toutefois dans les premiers jours de Mars cette phalange commença à exécuter quelques mouvements obscurs qui devinrent plus marqués par la suite et qui doivent, selon toute apparence, être attribués à une adhérence établie entre les tendons fléchisseurs et la cicatrice.



Dans ce cas, comme cela a lieu si communément, nous n'eûmes pas le choix du procédé opératoire. Celui-ci nous fut imposé par les dispositions des parties et la forme de la lésion. Il différa peu pour la phalangette et la phalangine de celui que nous eussions adopté si le choix avait été possible, mais il s'écarta de celui que nous croyons le meilleur pour la désarticulation metacarpo-phalangienne. Dans celle-ci, en effet, on a tout avantage à tailler deux lambeaux latéraux, parce que la tête metacarpienne est comprimée dans le sens latéral, que les lambeaux contiennent les prolongements des vaisseaux et des nerfs collatéraux et que la cicatrice qui repose sur un fond régulier n'est point exposée, malgré sa direction médiane, à des pressions et à des frottements nuisibles. Au contraire dans la désarticulation des phalanges le mode opératoire qui consiste à tailler deux lambeaux latéraux doit être repoussé. L'avantage qu'il a de conserver les nerfs et vaisseaux collatéraux est bien loin de compenser les inconvénients qui résulteraient de la formation de deux lambeaux opposés suivant le plus grand diamètre de la surface articulaire et ceux qu'entraînerait une cicatrice médiane, reposant sur un fond inégal et exposée à tous les contacts irritants.

Les anciens amputaient le plus souvent les phalanges dans la continuité et à l'aide de moyens



barbares tels que l'emploi de tenailles incisives, de la gouge et du maillet, etc. Les modernes de leur côté amputent, presque tous, les phalanges dans la contiguité. Nous pensons avec plusieurs auteurs S. Cooper, Guthrie, Velpeau, Sedillot, etc., que tout en rejetant les procédés grossiers des chirurgiens anciens il y a lieu d'adopter leur pratique et de conserver aux doigts la plus grande longueur possible. Si dans le cas de L..... nous n'avons pas recouru à l'amputation dans la continuité des phalanges c'est que la nature des altérations ne nous l'a pas permis. En vertu de ce même principe que, dans tous les cas, le chirurgien doit conserver le plus de parties possible, nous repoussons la pratique de Dupuytren qui, ainsi que nous l'apprennent MM. Sanson et Bégin, dans les cas d'amputation du medius ou de l'annulaire conseillait d'emporter la tête metacarpienne correspondante. Il est d'ailleurs démontré aujourd'hui qu'après l'amputation d'un doigt la tête du metacarpien ne tarde pas à s'aplatir et diminue ainsi de beaucoup l'écartement des deux doigts voisins auquel Dupuytren avait voulu remédier.

*Désarticulation scapulo-humérale. Guérison.*

M..... du 19<sup>e</sup> léger, reçut le 10 juin, dans un combat contre les Hamouchas, une balle qui lui



traversa l'épaule droite d'avant en arrière. Il fut transporté le même jour à l'hôpital militaire de Sétif et, après avoir constaté l'ouverture de l'articulation scapulo-humérale et une fracture irrégulière de l'humérus qui, d'une part, se dirigeait vers la tête de l'os et de l'autre projetait une fêlure oblique inférieurement, nous nous décidâmes à pratiquer immédiatement la désarticulation scapulo-humérale. La direction du trajet creusé par la balle nous engagea à faire usage de l'un des deux procédés décrits par Dupuytren: le membre étant écarté du tronc je soulevai le deltoïde, glissai d'avant en arrière et au-dessous de l'acromion un couteau long et mince qui rasa l'humérus et taillai aussitôt mon premier lambeau qui fut relevé par un aide; puis j'incisai les tendons et la capsule articulaire et contournai la tête de l'humérus en coupant successivement les muscles qui se présentaient sous l'instrument. Au moment d'opérer la section des attaches du grand pectoral, du grand dorsal et du grand rond, je fis saisir toute l'épaisseur des parties molles non divisées de manière à comprimer l'artère et terminai l'opération. L'artère axillaire et les deux artères circonflexes furent liées et les bords de la plaie furent réunis par quelques points de suture. Après le pansement le malade fut rapporté à son lit; il passa une nuit excellente, dormit pendant quelques heures et nous le trou-



vâmes le lendemain l'esprit tranquille et confiant. La fièvre traumatique ne fut marquée que par une légère chaleur à la peau et un peu d'accélération dans le pouls que nous notâmes quarante heures après l'opération. Le sujet fut maintenu à la diète le premier et le second jours, il eut du bouillon le troisième et le quatrième. Le cinquième, les nuits étant bonnes, l'état général étant satisfaisant et le sujet insistant pour avoir des aliments, nous lui accordâmes deux potages gras. L'appareil ne fut levé qu'après six jours révolus. La réunion par première intention était obtenue sur les trois quarts de la plaie ; les seuls points où elle manquât correspondaient 1<sup>o</sup> au paquet des ligatures ; 2<sup>o</sup> à l'angle postérieur de la plaie où nous avions été forcé de conserver une petite portion des tissus traversés par la balle. Dans les jours qui suivirent les ligatures tombèrent ; les surfaces non réunies bourgeonnèrent, se rapprochèrent peu à peu et dès le vingtième jour le sujet, qui mangeait la demi-portion d'aliments avec du vin, se promenait et put être considéré comme guéri. L'angle postérieur de la plaie continua encore cependant à fournir de la suppuration pendant deux mois à peu près.

Le succès habituel de la désarticulation scapulo-humérale quand elle est pratiquée chez des sujets jeunes et sains est connu depuis longtemps. Plusieurs chirurgiens, Lafaye, Larrey, M. Gouraud père



ont même mis en question si, dans les plaies d'armes à feu, elle n'était pas préférable à l'amputation dans la continuité. Larrey surtout qui compte 90 guérisons sur 100 opérés a insisté sur ce fait pratique. Quant à nous, tout en reconnaissant la force des arguments mis en avant par les auteurs que nous venons de citer, nous nous rangeons à cette opinion de Percy : « Si la perte du bras, quand il a  
« été amputé dans sa continuité, est un grand  
« malheur, celle de ce membre quand on a été  
« forcé de le désarticuler en est un plus grand  
« encore. Dans ce second cas point de moignon  
« pour serrer encore quelque chose comme une  
« canne, un mouchoir contre la poitrine, pour  
« tenir les bretelles d'un sac ou d'une hotte chez  
« un ouvrier, pour porter enfin le simulacre plus  
« ou moins utile d'un membre dont on ne veut  
« pas rendre la privation trop manifeste. »

La particularité de cette observation sur laquelle nous appellerons surtout l'attention est l'usage de points de suture. Depuis le mémoire de Pibrac ce moyen nous semble avoir été beaucoup trop négligé. Personne ne conteste l'avantage immense qu'il y a, surtout dans les plaies qui offrent une vaste surface, à obtenir une réunion par première intention, même partielle. Or, pour arriver à ce résultat, la première condition est la continuité et l'immobilité du contact entre les parties divisées,



contact que les bandages et les bandelettes agglutinatives ne peuvent procurer que dans un très-petit nombre de cas. Il nous semble donc qu'il y a lieu de revenir sur l'abandon dont la suture a été l'objet et, sans le conseiller dans beaucoup de circonstances où quelques chirurgiens étrangers la pratiquent encore : hernie étranglée, castration, etc., nous croyons cependant qu'elle pourrait être employée avec avantage après une foule d'opérations.

*Amputation du quatrième orteil, amputation du cinquième orteil et résection du métatarsien correspondant.*

V.... du 43<sup>e</sup> de ligne, entré à l'Hôpital militaire de Sétif le 5 Janvier, a passé la nuit précédente dans un douar arabe où il a pu s'approcher du feu. Ses pieds sont rouges, tuméfiés et extrêmement douloureux. Des taches violettes foncées existent sur tous les orteils du pied gauche et, au pied droit, sur les quatrième et cinquième orteils et sur le côté externe du cinquième métatarsien. Douleur dans les jambes, dans les cuisses et aux aines. Peau chaude, pouls légèrement accéléré. Le sujet est mis au quart; ses pieds et ses jambes sont frictionnés avec de l'huile camphrée et enveloppés avec de la flanelle.



Le 20 Janvier le pied gauche est à peu près rentré dans ses conditions normales; mais les taches livides indiquées sur le pied droit se sont transformées en escharres qui se détachent en laissant à nu les phalanges des quatrième et cinquième orteils et une partie du cinquième métatarsien. La perte des phalanges et de la partie du métatarsien dénudées était inévitable; j'en pratiquai l'ablation le lendemain. Après avoir taillé les parties molles d'après la méthode ovalaire, le cinquième métatarsien fut scié obliquement dans sa continuité. Il ne s'écoula que très-peu de sang et il n'y eut pas lieu à appliquer de ligature. Le quatrième orteil fut aussitôt après extirpé suivant le seul procédé que l'altération des parties molles rendit possible. La peau fut incisée presque circulairement mais en ménageant toutefois une plus grande partie de celle-ci au côté interne de l'orteil. La réunion immédiate fut tentée inutilement; la cicatrisation n'eut lieu qu'après suppuration et ne fut complète que le 10 mars. Ici encore nous avons été forcé, pour faire cesser l'état fongueux des surfaces divisées et la suppuration séreuse qui s'en écoulait de nourrir notre malade d'une manière substantielle et d'exciter sa plaie tout à la fois par l'emploi du styrax et par de fréquentes applications d'azotate d'argent.

Il est de précepte généralement adopté de ne



point amputer le cinquième métatarsien dans la continuité mais de le désarticuler. Ce précepte qui a pour motif la facilité de la désarticulation en ce point et la régularité de la plaie qui en résulte, nous semble devoir être le plus souvent enfreint parce que, en règle générale, il ne faut enlever que les parties dont la conservation est impossible, parce que pour le métatarse en particulier la présence de l'extrémité postérieure d'un métatarsien, que ce soit le cinquième ou le premier, élargit la base de sustentation, complète la voûte transversale du pied et offre à son côté externe ou interne un point d'appui d'une grande importance.

*Amputation du gros orteil du pied gauche. — Ré-sorption purulente.*

G.... du 43<sup>e</sup> de ligne, est arrivé à Sétif le 4 Janvier vers six heures du soir. Ses deux pieds ont contracté au milieu des neiges du Bou-Thaleb une asphyxie qui lui paraît peu inquiétante; ils sont seulement insensibles et engorgés. Après avoir mangé la soupe G... s'endort d'un profond sommeil. Au bout de quelques heures une douleur ressentie au pied gauche et donnant la sensation de la brûlure le réveille. Dans la matinée suivante il aperçoit sur le côté interne du gros orteil une phlyctène qu'il perce avec une épingle et d'où s'écoule une sérosité



rougeâtre. Pendant plusieurs jours le sujet ne fit pas attention à son état; mais enfin, une escharre noirâtre s'étant formée sur le lieu qu'occupait la phlyctène, il se décide à entrer à l'hôpital le 14 Janvier. Il a un appétit excellent, sa santé générale paraît bonne et nous lui accordons les trois quarts de la portion alimentaire avec du vin. Le 16 l'escharre se détache. Elle comprend toute l'épaisseur du derme et met à découvert des bourgeons très-rouges. Pansement simple.— 23 Janvier. La plaie gagne en superficie et en profondeur; elle devient blafarde, comme fongueuse; la santé générale est toujours bonne. Trois quarts de portion. Pansement avec du styrax.— 31 Janvier. La plaie est très-large; ses bords sont renversés et fournissent une suppuration séreuse, son fond est constitué par la première phalange du gros orteil qui est nécrosée. Nous procédons à l'amputation de cet orteil d'après la méthode ovulaire et réunissons par première intention à l'aide de bandelettes agglutimatives.— 4 Février. L'appareil est levé. La réunion immédiate a échoué; les bords de la plaie ont de la tendance à se renverser; ils sont blafards et fongueux. Les bandelettes sont retirées; nous passons l'azotate d'argent sur les surfaces divisées et pansons avec de l'onguent styrax. Le régime du sujet qui, depuis l'opération, avait été sévère est élevé d'abord au quart de la portion et



le lendemain à la demie. -- 8 Février. Un foyer développé entre les deux premiers métatarsiens est ouvert. — 15 Février. La plaie résultant de l'amputation se retrécit peu à peu, point d'engorgement. La contre-ouverture pratiquée le 8 fournit toujours de la suppuration. Le sujet a un grand appétit, nous lui accordons les trois quarts. — 26 Février. La santé générale est restée fort bonne. Les plaies n'ont pas changé d'aspect mais aujourd'hui, vers quatre heures, s'est manifesté un frisson intense qui, au bout de deux heures, a été suivi d'une réaction assez forte. Pendant la nuit un nouveau frisson se présente. Le lendemain, à la visite du matin, la peau est moite et a une température normale; pouls large et mou, à 70, langue plate et blanche, pas d'évacuation alvine depuis deux jours; aucune espèce de douleur soit à l'abdomen, soit ailleurs. La contre-ouverture pratiquée entre les deux premiers métatarsiens est complètement cicatrisée. La plaie de l'amputation, presque fermée, ne montre plus que quelques bourgeons charnus et suppure à peine. Nous hésitons à caractériser la nature des frissons qui se sont montrés la veille: d'une part leur retour à quelques heures d'intervalle n'appartient que par exception très-rare à la fièvre intermittente et au contraire se rencontre souvent dans les résorptions purulentes; d'autre part la résorp-



tion purulente est difficile à admettre chez un sujet jusqu'alors si bien portant et précisément au moment où la plaie est sur le point d'achever sa cicatrisation. Heureusement dans l'un comme dans l'autre cas le quinine est indiqué. Nous en prescrivons 15 décigrammes que le malade prendra en trois doses et à huit heures d'intervalle. Diète. Lavement émollient. 28. Plusieurs frissons irréguliers ont encore eu lieu ; langue large humide et blanche, nausées, soif vive, pas de selle, sensibilité épigastrique, le reste de l'abdomen est indolent ; douleurs de l'épaule droite et du bras droit qui interdisent tout mouvement de ce membre mais qui ne s'accompagnent ni de rougeur ni de tuméfaction ; suffusion ictérique à la peau et aux conjonctives. Pouls plein, mou, à 80. Diète. Saignée 400 grammes, 4 ventouses scarifiées à l'épigastre. Sulfate de quinine 15 décigrammes à prendre comme la veille. Lavement laxatif. -- 29. Cinq selles ont eu lieu. Le caillot de la saignée n'offre aucune trace de couenne. Il y a encore eu des frissons. L'épaule droite est toujours douloureuse ; le genou du même côté paraît s'engager. La cicatrice qui recouvrait la tête du métatarsien et qui était presque complète s'est déchirée et les parties molles ont subi une rétraction qui laisse à découvert la partie articulaire de cet os. Nous ne doutons plus qu'une résorption purulente ne se soit établie chez ce malade et, malgré



les cas de guérison par le sulfate de quinine, par les purgatifs ou les sudorifiques, que la clinique chirurgicale enrégistre de loin en loin dans cette circonstance, nous ne pouvons nous empêcher de porter un pronostic défavorable. Le sujet est transporté dans une petite salle dont l'aération est facile et où il a un volume d'air double ou triple de celui qu'il avait antérieurement. Nous prescrivons des changements de linge très fréquents, des aspersions chlorurées autour de son lit et nous nous proposons tout à la fois d'insister sur l'emploi du sulfate de quinine et de provoquer, suivant les circonstances, des évacuations alvines ou des sueurs abondantes.

Dans les jours qui suivent la peau et les conjonctives deviennent beaucoup plus jaunes. Les douleurs de l'épaule et celles du genou sont plus vives. Une petite éruption vésiculeuse se forme sur la paupière supérieure de l'œil droit et aux commissures des lèvres. Soif, nausées, deux ascarides lombricoïdes sont rejetés par la bouche. Le sulfate de magnésie détermine deux à trois selles par jour. Il y a encore de temps à autre des frissons irréguliers. Le quinine et le sel de magnésie sont abandonnés et nous avons recours à des lavements aqueux et à des boissons en très-grande abondance. Nous donnons aussi quelques légers aliments. Riz au lait, pruneaux, etc. 6 Mars. Les douleurs arti-



culaires ont presque disparu. Délire; état adynamique, bouche fuligineuse. La mort a lieu le lendemain, 7 Mars, à 5 heures du soir.

*Autopsie dix-neuf heures après la mort.*

La teinte ictérique de la peau est très-prononcée. La tête du premier métatarsien gauche est privée de son cartilage; il n'y a nulle part de fusée purulente; les veines tant superficielles que profondes sont ouvertes depuis les orteils du pied gauche jusqu'à la veine cave. Nous constatons une véritable phlébite partant de la surface suppurante et s'étendant dans la veine saphène interne à une hauteur de trente centimètres et plus. Là la veine est épaissie, d'un rouge vif, ses parois sont opaques; elle ne présente nulle part de caillot obturateur.

*Crâne.* Pie-mère injectée. Une petite quantité de pus se rencontre à la partie inférieure et postérieure de l'hémisphère droit. Le centre ovale de Vieussens est sablé mais sa consistance est normale. Rien de plus à noter de ce côté.

*Cavité thoracique.* Le cœur est flasque et ramolli. Les poumons sont assez fortement engorgés à leur partie postérieure. La muqueuse bronchique est d'un rouge intense.

*Cavité abdominale.* Rate triplée, mollasse, d'un tissu brunâtre. Foie volumineux, d'une couleur



jaune pâle, ne contenant que peu de sang. Les deux espèces de granulations y sont parfaitement distinctes. A peu près au centre du grand lobe existe un foyer qui admettrait une grosse orange et où se trouve un pus séreux plus intérieur et un pus concret à la circonférence. Ce foyer n'est point enkysté il a pour parois le tissu même du foie qui, en cet endroit, est violacé et friable. Bile épaisse, d'une couleur verte foncée. La muqueuse de l'estomac montre, dans le grand cul de sac, des arborisations fines et serrées; son orifice pylorique est entouré de taches sanguinolentes de un à deux millimètres de diamètre. La muqueuse des intestins grêles n'offre à noter que quelques rougeurs peu étendues. Celle du gros intestin est tout-à-fait saine. Trois ascarides lombricoïdes très-volumineux ont été trouvés vers la fin de l'iléon.

L'ouverture des articulations montre du pus dans les deux épaules et dans les deux genoux. Ce produit morbide se rencontre en outre dans les muscles triceps crural des deux côtés.

La question de la résorption purulente ne dépassera peut-être jamais la hauteur où elle s'est élevée, grâce surtout aux travaux des anatomo-pathologistes français, aussi n'avons nous nullement la prétention de présenter des considérations nou-



velles à propos du fait qu'on vient de lire. Que les phénomènes de l'infection purulente puissent survenir sous l'influence d'une plaie de minime étendue et alors même que cette plaie est sur le point d'être complètement cicatrisée, c'est là un fait vulgaire et admis sans contestation. Quant au mécanisme suivant lequel s'établit cette infection, les opinions, il est vrai, diffèrent : les uns, avec Maréchal, admettent l'introduction du pus en nature dans le sang, par suite de l'aspiration que les extrémités béantes des veines opèrent à la surface des plaies ; le plus grand nombre, avec MM. Cruveilhier, Blandin et P. Bérard, rejettent cette manière de voir et posent en principe que le pus trouvé dans les vaisseaux est toujours la conséquence d'une phlébite ; M. Teissier s'emparant d'une idée jetée sous forme dubitative par M. Andral dans sa clinique médicale, professe que le pus rencontré dans les veines et dans les parenchymes organiques, à la suite des amputations, des plaies ou des accouchements, ne provient ni d'une phlébite, ni d'une absorption mais bien d'une fièvre ou d'une diathèse purulente, diathèse caractérisée par la tendance à la production du pus dans les solides et dans les liquides coagulables de l'économie ; plusieurs pathologistes enfin se rangeant à une opinion qui appartient, je crois, à M. Jobert, pensent que l'infection purulente peut être la conséquence d'une lym-



phangite. Si l'on en excepte la diathèse de M. Teissier qui, bien que présentée avec une profonde conviction et soutenue par lui avec éclat dans une discussion contre M. Blandin, nous semble néanmoins inacceptable, toutes les opinions que nous venons d'énumérer doivent être admises comme partie de la vérité. La résorption qui explique seule certains cas d'abcès métastatiques et qui avait été repoussée comme impuissante à introduire les globules de pus dans la circulation n'a plus rien qui répugne à la raison depuis qu'il a été démontré qu'elle pouvait, en toutes circonstances, faire passer à travers les capillaires l'élément séreux du pus et les granules dont le diamètre ne dépasse pas  $\frac{1}{500}$  à  $\frac{1}{600}$  de millimètre. La phlébite, ainsi que des milliers de faits l'ont prouvé, est certainement la source la plus fréquente de l'infection purulente. Des faits de lymphangite pouvant seuls expliquer l'infection purulente ont été observés par M. Jobert et plusieurs anatomo-pathologistes. Il faut donc reconnaître à l'infection purulente une origine multiple.

Dans le cas de G... c'est la phlébite qui a été le point de départ de cette infection et elle était ici d'autant plus intéressante à constater que, sur aucun point, la veine enflammée ne contenait de caillot interdisant le passage du pus de la partie malade du vaisseau dans la partie saine et consécutivement dans la circulation générale. J. Hunter



avait déjà signalé un fait analogue chez un individu qui mourut à l'hôpital Saint-Georges à la suite d'une phlébite déterminée par une saignée, fait sur lequel M. Teissier, dont il gênait la théorie, a cherché à élever des doutes. L'observation actuelle corrobore celles d'ailleurs inattaquables qui ont été opposées à M. Teissier par MM. Blandin, Velpeau, Ribes, etc., et dans lesquelles, comme chez le sujet de Hunter, la phlébite n'avait point déterminé de caillot obturateur.

Les résorptions purulentes sont fréquentes en Algérie et notamment dans la province de Constantine. J'ai entendu M. Vital, Médecin en chef de l'hôpital militaire de Constantine, dans une leçon faite au commencement de 1844, établir avec une grande solidité que ces résorptions ont surtout lieu en automne, alors que l'abaissement presque subit et très marqué de la température fait passer la peau, d'une activité sécrétoire prononcée, à un état voisin de l'inaction. Il considérait un certain nombre des abcès du foie qui, si fréquemment, coexistent avec les dyssenteries chroniques comme un résultat de l'absorption opérée par les radicules de la veine porte à la surface des ulcérations profondes et nombreuses qui couvrent, dans ces cas, la muqueuse du gros intestin. Il ajoutait, en se fondant sur des recherches anatomo-pathologiques poursuivies depuis dix ans et sur deux à trois mille



cadavres, que, chez les sujets où les abcès du foie devaient être attribués à la résorption purulente, il arrivait assez fréquemment que les veines mesaraïques, ne présentassent aucune inflammation, et qu'alors même qu'il y avait phlébite on ne rencontrait jamais, comme cela se voit dans l'inflammation des autres veines, de caillot obturateur.

Plusieurs traitements ont été conseillés contre l'infection purulente. Celui que nous adoptâmes fut surtout déterminé par cette remarque que les abcès métastatiques, à Constantine, se développent particulièrement au moment où la peau perd son activité sécrétoire. Nous cherchâmes à activer les sécrétions de la muqueuse digestive d'abord par l'emploi du sel de magnésie, et celle de la peau ensuite par l'usage de lavements aqueux et de boissons abondantes. Le sulfate de quinine auquel on attribue plusieurs cas de guérison d'infection purulente et qui paraît plus applicable encore en Afrique qu'en France, fut administré pendant plusieurs jours.

*Amputation de la jambe droite et de tous les orteils du pied gauche. — Guérison.*

Ahmed-ben-Saïd, tirailleur indigène, âgé de 19 ans environ, constitution faible, a été fortement éprouvé par le froid qui a assailli nos troupes



pendant l'expédition du Bou-Thaleb. Il est resté dans les douars arabes depuis le 3 jusqu'au 10 Janvier, époque où il fut transporté à Sétif sur un mulet. Il entre à l'hôpital le 15 Janvier: pieds engorgés et violacés, des escharres noires et flétries couvrent les orteils des deux pieds. La santé générale, malgré une faiblesse assez grande, paraît n'avoir pas souffert. J'accorde les trois quarts et attends pour prendre un parti décisif la chute des escharres.

20 Janvier. Les forces se sont un peu relevées. Les phalangettes de tous les orteils sont tombées d'elles-mêmes peu après la chute des escharres. Des bourgeons charnus qui paraissent d'une bonne nature se sont développés sur les plaies. -- 8 Février. Les plaies sont boursouflées, agrandies et donnent lieu à une suppuration mauvaise. Les phalanges du pied gauche et les métatarsiens du pied droit sont à découvert; en outre, de ce dernier côté, la peau qui recouvre le pied et la moitié inférieure de la jambe est violacée et paraît atteinte profondément. Nous nous empressons d'opérer. Tous les orteils du pied gauche sont amputés d'après le procédé de M. Lisfranc puis, le pansement étant fait, nous passons à l'amputation de la jambe droite au lieu d'élection.

Cette opération ne présente rien de particulier, trois points de suture maintiennent les bords de



la plaie en contact. -- 13 Février. Aucune réaction fébrile ne s'est manifestée; il y a au contraire une dépression des forces assez forte pour nous causer des inquiétudes. Le sujet a mangé la soupe au lait dès le lendemain de l'opération, nous augmentons peu à peu ses aliments et nous lui donnons du vin de cannelle composé. -- 14. L'appareil est levé; aucun travail d'adhérence n'est encore commencé du côté de la jambe; les bords et le fond de la plaie sont blafards, grisâtres et fournissent une suppuration peu abondante. La plaie du pied gauche a un aspect plus favorable, la réunion a commencé sur quelques points. Toutes les ligatures se sont détachées. -- 18 Février. Les forces se sont relevées, le pouls est plus fort et plus fréquent. L'appétit est prononcé. Depuis quelques jours le sujet est à la demi-portion d'aliments et de vin et prend de la limonade vineuse. Les plaies ont un aspect meilleur. Celle de la jambe droite commence à se rétrécir et donne une suppuration de bonne nature, celle du pied gauche est presque complètement cicatrisée. -- 26 Février. État général excellent. La surface suppurante de la jambe a à peine deux à trois centimètres de longueur, celle du pied est guérie. -- 10 Mars. La cicatrice est complète à la jambe.

Les seules réflexions que fasse naître cette observation sont relatives à la nécessité impérieuse,



dans la presque totalité des cas d'opérations pratiquées pour des congélations, d'accorder au malade des aliments et du vin. Le régime seul, en effet, réussit à modifier ces plaies fongueuses et boursouflées qui s'observent alors fréquemment et qui donnent, à si juste titre, des inquiétudes au praticien.

*Amputation des deux jambes. — Guérison.*

B.... clairon au 2<sup>e</sup> de ligne, âgé de 34 ans, constitution vigoureuse, avait assez bien supporté les misères de l'expédition du Bou-Thaleb. Vers la fin de la dernière journée, le 4 Janvier, une sorte d'ivresse s'empare de lui, sa vue se trouble, sa marche est incertaine et plusieurs fois il se laisse choir. Il comprend cependant l'importance d'avancer et hâte le plus qu'il peut ses pas vacillants. Le sommeil le surprend deux fois, pendant la nuit, sur un sol couvert de neige. Toutefois le lendemain il est trouvé à une demi-lieue de Sétif et placé sur un cheval qui le ramène dans cette ville. Ses pieds lui paraissent si lourds, ses cuisses et ses jambes sont tellement douloureuses qu'il ne peut descendre de cheval. Un de ses camarades le transporte à la caserne et le déshabille. A peine ses souliers sont-ils enlevés que ses pieds deviennent énormes. On lui donne un peu d'eau-de-vie et il



s'endort. Le lendemain il est transporté à l'hôpital. La réaction générale a déjà eu lieu; elle est modérée. Aucun mouvement réactionnaire local ne s'est au contraire établi du côté des pieds et nous craignons que l'hyposthénie déterminée par le froid n'ait déjà enrayé la vie dans ces parties. En effet, dans les jours qui suivent, bien que la réaction générale se maintienne, les pieds restent froids et violacés, seulement des douleurs s'y développent. Bientôt la gangrène a détruit les parties molles qui recouvrent les orteils et peu à peu envahit celles des jambes. Suivant les préceptes que nous avons précédemment émis, la constitution offrant des ressources et la réaction générale s'étant établie, bien que la gangrène ne se limitât pas, nous croyons devoir nous presser d'opérer. Les deux jambes sont amputées au lieu d'élection, le 20 Janvier. Une amélioration marquée se manifeste dès le premier jour. Il y a du sommeil, de l'appétit et trois jours après l'opération nous accordons un œuf, du pain et un peu de vin. Le 26 l'appareil est levé pour la première fois: du côté gauche la plaie est réunie à ses angles supérieur et inférieur mais la partie moyenne restée béante présente un aspect blafard. La ligature de la tibiale antérieure tient encore. Des bandelettes agglutinatives rétablissent le contact des deux lèvres de la plaie à la partie moyenne du moignon. A la jambe



droite la peau qui a été repliée pour recouvrir le moignon présente, juste à la partie moyenne de celui-ci et de chaque côté de la ligne de réunion, une partie sphacélée dont l'étendue peut équivaloir à une pièce de deux francs. Ici toutes les ligatures se sont détachées. De nouvelles bandelettes rétablissent autant que possible le contact des deux lèvres de la plaie. Dans les jours qui suivent des lambeaux de tissu cellulaire se détachent de l'un et de l'autre côtés. Les plaies sont pansées avec de l'onguent styrax; le sujet est mis à l'usage des viandes roties et du vin de Bordeaux et peu à peu des bourgeons charnus de bonne nature se présentent. Les plaies se retrécissent de jour en jour et leur cicatrisation est définitivement achevée le 24 Février.

La question de savoir si dans les cas qui exigent l'ablation des deux membres il convient d'opérer coupsur coup ou de mettre entre les deux opérations un certain intervalle a été résolue par nous dans le premier sens. A moins que des circonstances très-graves, de nature à faire craindre actuellement pour la vie du sujet, n'y apportent de contre-indication nous croyons, avec la majorité des praticiens, que cette conduite doit toujours être suivie. Au point de vue des conditions morales il est essentiel d'en finir, en une seule séance, avec les souffrances et de ne pas laisser en perspective,



après une opération grâve et douloureuse, une seconde opération de même nature. Au point de vue matériel il y aurait tout lieu de craindre qu'une première amputation ne fut très-fâcheusement influencée par celle qui serait pratiquée vingt-quatre ou quarante-huit heures plus tard, soit à cause de la douleur que celle-ci éveillerait, soit à cause de la fièvre traumatique qu'elle provoquerait.

B..... est un nouvel exemple de l'influence du régime sur la marche des plaies qui succèdent aux congélations. Nous ne mettons pas en doute qu'un régime sévère n'ait porté obstacle à la cicatrisation, favorisé la suppuration de mauvaise nature qui tendait à s'établir et compromis par suite l'existence du malade.

Nous croyons devoir terminer cette seconde partie de notre travail, comme l'a été la première, par des propositions. Celles-ci résumeront la conduite que doit, suivant nous, tenir le chirurgien dans les amputations.

I. Dans les Hôpitaux les amputations doivent être considérées comme une ressource extrême. Il n'y faut recourir que pour sauver la vie au malade alors que toute espérance de le guérir sans mutilation a disparu.

II. Sur le champ de bataille la pratique des am-



putations est soumise aux mêmes règles. Seulement il faut se rappeler que les conditions sont ici différentes. L'éloignement de tout établissement fixe, la nécessité d'un transport difficile et pénible pendant plusieurs jours, rendent immédiatement compromettantes pour la vie des blessures qui, en d'autres circonstances, n'auraient offert qu'un danger éloigné et auraient permis de temporiser.

III. De là la nécessité de retrancher pendant les expéditions militaires beaucoup de membres qui dans un hôpital auraient pu être conservés.

IV. Les amputations doivent toujours être pratiquées de manière à faire courir aux malades le moins de risque possible. Cette considération détermine le moment de l'opération, le lieu d'élection où il convient de la pratiquer et le choix de la méthode à employer.

V. Les amputations, sauf quelques rares exceptions, sont d'autant plus dangereuses qu'on y a recours sur un point plus rapproché du tronc. C'est donc le plus loin possible de celui-ci qu'il faut les pratiquer.

VI. Toutes les considérations doivent être subordonnées à la proposition précédente. Cela est vrai particulièrement à propos du choix qu'il y a à faire entre l'amputation dans la contiguité et celle dans la continuité. L'une ne doit être préférée à l'autre que si elle permet d'opérer plus bas.



VII. Les amputations dans la continuité et celles dans la contiguité, mises en regard sous le rapport des dangers qu'elles entraînent, présentent des inconvénients et des avantages à très-peu près équivalents.

VIII. L'amputation dans la continuité est d'une exécution facile; elle fournit une plaie égale et régulière qui se prête également à la réunion immédiate et à la réunion par seconde intention; elle permet le plus souvent l'emploi d'un procédé avantageux; elle laisse la facilité, dans les cas d'altération osseuse dont la limite n'aurait pu être d'abord déterminée, de porter, suivant les besoins, la scie plus ou moins haut. Mais plusieurs inconvénients doivent être opposés à ces avantages: la nécessité de scier l'os rend l'opération plus longue. Il est quelquefois difficile d'obtenir un moignon en cône creux, de là position superficielle de l'os qui retarde la réunion de la plaie, provoque une suppuration abondante et expose à des abcès plus ou moins profonds et à l'inflammation du tissu médullaire; de là, après la guérison, ulcération de la cicatrice. La rétraction des chairs, qui peut s'observer dans les cas même où l'opération a été le mieux faite, entraîne la saillie de l'extrémité osseuse et la nécessité d'une résection consécutive à moins que l'on ne préfère attendre la nécrose et la chute de la partie d'os dénudée. La section de



l'os peut donner lieu à la blessure de l'artère nourricière ou de ses branches d'où hémorrhagie quelquefois très-grave. La partie spongieuse de l'os divisé semble prédisposée aux résorptions purulentes.

IX. L'amputation dans la contiguité a pour avantage de n'exiger qu'un seul instrument, le couteau, et de s'exécuter avec une grande rapidité. Elle est par conséquent moins douloureuse et fait perdre moins de sang. La cicatrisation de la plaie s'opère presque toujours sur les seuls téguments et marche rapidement. L'extrémité osseuse est revêtue de son cartilage, circonstance qui entraîne ce triple avantage : elle est moins irritante pour les parties molles ; elle interdit toute hémorrhagie par l'artère nourricière ; elle rend presque impossible l'inflammation médullaire. Mais d'un autre côté elle mérite plusieurs reproches : l'étendue de la surface articulaire mise à nu peut être très-considérable et difficile à recouvrir de parties molles. La peau qui constitue quelquefois à elle seule l'épaisseur des lambeaux peut s'ulcérer et compromettre la guérison. Des altérations osseuses qui auraient exigé une amputation en un lieu plus élevé peuvent rester inaperçues et interdire la guérison ou exiger une nouvelle opération. Les ligaments et les tendons compris dans la section peuvent se gangréner et entretenir des fistules. La chute des cartilages et



leur séjour dans l'épaisseur du moignon peuvent avoir le même résultat. Les surfaces synoviales favorisent l'absorption purulente. Les gaines des tendons qui s'étendent autour des articulations peuvent s'enflammer et donner lieu à des fusées du pus. L'inégalité de la plaie est désavantageuse à toute réunion et peut faciliter la formation d'abcès métastatiques.

X. Dans les plaies d'armes à feu la résection, quand elle est possible, doit toujours être préférée à l'amputation pour les membres supérieurs. Pour les membres inférieurs l'amputation doit généralement être préférée. Il ne faut poser en exception à cette règle que la résection de l'articulation tibio-tarsienne et celle des os du tarse et du métatarse.

XI. Dans une foule de circonstances les amputations ne peuvent être faites suivant les procédés réguliers décrits par les auteurs. Aussi, pour le praticien et particulièrement pour le chirurgien militaire, une connaissance profonde de l'anatomie et l'habitude des opérations sont elles préférables aux notions de manuel opératoire acquises dans les livres.

XII. Après ce principe fondamental qu'il convient, dans tous les cas, d'opérer le plus loin possible du tronc il n'en est pas de plus général que celui de pratiquer, en amputant, la surface saignante la plus simple et la moins étendue.



XIII. Les plaies qui succèdent aux amputations doivent, dans tous les cas, être réunies par première intention.

XIV. Les conditions qui seules peuvent amener la réunion par première intention sont : 1<sup>o</sup> la continuité et l'immobilité du contact entre les deux lèvres de la plaie et 2<sup>o</sup> ce degré salubre d'inflammation qui a reçu de Hunter le nom d'inflammation adhésive.

XV. L'immobilité du contact ne peut être assurée dans beaucoup de circonstances, et surtout lorsqu'il s'agit d'amputés à transporter à dos de mulet, sur une litière, pendant plusieurs jours, que par l'emploi des sutures. Il ne faut point toutefois compter sur leur secours pour amener le contact de lambeaux trop courts ; la traction qu'elles exercent dans ces cas produirait des accidents d'étranglement, des inflammations dangereuses et des déchirures.

XVI. L'inflammation adhésive de Hunter exige une certaine somme de stimulation. Par un régime trop débilitant, par une diète trop prolongée on courrait risque d'empêcher son développement et d'interdire la réunion immédiate.

FIN.



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**TABLE**  
**DES MATIÈRES.**

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**NARRATION DES ÉVÈNEMENTS. . . . . 1—20**

Troubles excités par Si-Saad. — Départ d'une colonne de 2,800 hommes. — Combat livré aux Ouled-Bou-Moussaad. — Évacuation des malades sur Sétif. — Destruction de la zaouia de Si-Saad. — La neige commence à tomber le 2 Janvier. — Le camp est établi chez les Ouled-Moessa. — Souffrances des troupes. — Marche sur Sétif le 3 Janvier. — Difficulté avec laquelle la colonne sort de la gorge où elle a passé la nuit. — Abandon des vivres et du matériel. — Asphyxies générales et partielles déterminées par le froid. — Dispersion des troupes qui rentrent à Sétif par petits groupes du 4 au 11 Janvier. — Dévouement de la garnison et de la population de Sétif.

**HOPITAL MILITAIRE DE SÉTIF. . . . . 21—25**

Cet établissement ne peut recevoir que 200 malades. — On lui annexe la caserne de l'Horloge où sont admis le plus grand nombre des hommes atteints de congélation. —



Les moyens de couchage manquent. — Le nombre des officiers de santé est insuffisant pour les nouveaux besoins qui viennent de surgir. — Élan général de chacun. — Service rendu par les infirmiers auxiliaires empruntés au 19<sup>e</sup> léger. — L'encombrement fait craindre la pourriture d'hôpital.

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actions nerveuse et circulatoire se maintient continue ou qu'elle est remplacée par une réaction.

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No. 1

# INTRODUCTORY LECTURE

ON

“THE ORIGIN AND MIGRATIONS OF THE  
DIFFERENT FAMILIES OF THE HUMAN RACE  
AS ILLUSTRATED BY THEIR LANGUAGES.”

BY F. S. B. F. CHAUMONT, ESQ.,

M.D., F.R.C.S.E., STAFF ASSISTANT SURGEON.

DELIVERED ON THE OCCASION OF THE  
OPENING OF THE YOUNG MEN'S SOCIETY IN CONNEXION  
WITH ST. ANDREW'S CHURCH; SOUTHAMPTON.

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*PUBLISHED AT THE REQUEST OF THE SOCIETY.*

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## LECTURE.

"MAN," says Oken, "is the sum of all animals, as well in regard of his form as of his mental powers." In like manner Ethnology, the science which treats of man, may be called the sum of all sciences, and the culminating point of human knowledge. Of its different branches the study of language is perhaps the most interesting, and probably the most important, and to this branch the present lecture will be confined.

The earliest attempts at linguistic science, were founded on the belief that the Hebrew\* was the primitive form of speech, and efforts were made to derive all language from that tongue; and there are not wanting men still, who are even now vainly striving in the same direction, allowing their zeal to blind them to the truth. It is not saying too much to affirm that modern linguistic science owes its existence to the establishment of the British power in Hindustan. Previous to that time, Sanskrit was known only by name, and it was not till some time after our power was firmly established, that the Brahmans could be induced to communicate their sacred language to an outcast race, who eat beef and crossed the black water! When at last the knowledge was obtained, it was like the rising of the sun after an Arctic night. A language was found, where none expected it, of such richness and beauty, so elaborate in its grammar, and so copious in vocabulary, as even to surpass the Greek, that vast mine, from which had been extracted the terms of science and philosophy for the whole of the then known world. Here were discovered links which connected the Greek, the Latin, and the Teutonic tongues together; here were roots which explained what appeared in these tongues isolated obscurities; and the origin was found of myths, which had lost their meaning in later times, and lingered apparently as senseless fables. Scarcely less valuable was the later discovery of the Zend, or original sacred language of the ancient Persians. What remained of that remarkable tongue, showed that in its perfection, it must have been at least equal in dignity of expression, and completeness of detail, to the Sanskrit and the Greek, and proved incontestably the right of the Persians to be admitted into the same family, which the eminently Semitic nature of the vocabulary of their recent tongue had rendered doubtful.

\*A glance at the tables will show the comparatively recent epoch of that tongue, old as it undoubtedly is.



The next grand step was the deciphering of the Egyptian hieroglyphics, by Young and Champollion. This, like the acquisition of Sanskrit, was due to conquest, as the Rosetta stone was one of the many monuments collected by Napoleon for transport to France, and which were taken by the English fleet and army, under Nelson and Abercromby. The subsequent reading of the cuneiform characters, by Rawlinson, Layard, and others, was a triumph worthy to be ranked with it. And here I need hardly do more than refer to the doubts expressed by the late Sir George C. Lewis, as to the actual interpretation of the Egyptian and Babylonian inscriptions. Cogent and ingenious as were his arguments, and backed as they were by deep and wonderful learning, it is, I think, admitted by the majority of people, that his scepticism was carried too far, and that the meaning of the inscriptions had been in the main arrived at.

The next great step, one of the most important of all, was the discovery of what is called Grimm's law, establishing for the Aryan family and chiefly for the Teutonic group, the laws by which a root is modified in passing from one language to another, and which appears to be nearly as fixed in its operation as any law in the more exact sciences.

The establishing of the Aryan character of the Celtic tongue by Prichard and Pictet, and the labours of Bunsen, Rénan, Max Müller and others, bring us down to the present time. I ought not to omit the names of Klaproth, Castren and Wilhelm von Humboldt, not to mention many others, to whom we owe much of what is known concerning the Turanian tongues, and the more recent labours of Stanislas Julien in the vast field of Chinese linguistic. This brief sketch will suffice to show in a general way the progress of the science of which I shall now proceed to speak more particularly.

In examining a language so as to fix its place in any particular group or family, two primary points must be attended to: its vocabulary or phenomenology, and its grammar or nomology. The results of the two studies may be very different, as the vocabulary of a language may change so far as to leave very few of the original words. This is the case with Persian and Turkish, in both of which there are many more Arabic than native words. It is, however, quite easy to see that neither Persian nor Turkish is a Semitic language. The reason is that, although the vocabulary may and does alter, the grammar remains the same. The Persian or the Turk may accept Arabic words to express his thoughts, but neither will express himself as an Arab; the Persian will retain his Aryan, the Turk his Turanian form of thought and expression. In our own tongue we may frame sentences which shall contain nothing but words of Latin origin, and which shall yet infallibly betray their Teutonic form. Thus, to take an example, in the sentence, "John's letter demands attention," every word is of Romance origin, but the possessive case, "John's," shows clearly that the sentence is Teutonic, as no Romance



language is capable of expressing itself in this way. Again it is equally certain, from the termination in *S*, of the verb in the 3rd person singular, that the sentence is of a particular branch of the Teutonic, nearly allied to the Gothic.\* It is by such a process of analytic investigation of separate tongues or *species* that we are led to the arrangement of cognate groups or *genera*. We then begin to discover some wider relationship between these last, which leads us on to the formation of *classes* and *families*, until we arrive at a point when we feel prepared to refer the whole to one or more primary types, beyond which evidence is wanting to carry us further. Leaving, then, the process of induction, we begin that of deduction, and by an operation of synthesis we can both trace the rise and the decadence of the various tongues, and can also refer directly to one or other of our established genera, classes and families, tongues hitherto unexamined.

When we find in different languages a number of words either obviously the same or easily traceable to common roots, we must enquire, 1st, Do these words represent primitive ideas? 2nd, If not, do the words representing primitive ideas belong to the same or to a different class? 3rd, If to a different class, can the words first examined be referred to conquest or to close intercourse with one or more foreign races? If we can ascertain an undoubted connection between the two languages examined, our next point is to settle the degree of relationship. Are they parent and child or children of the same parent? In many cases the vocabulary will suffice of itself to answer this question, but in some it will be necessary to have recourse to the more recondite question of grammar or form. Our first enquiry now will be, Is the language synthetic (*i.e.*, Does it use inflections, such as declensions and numerous tenses of verbs without auxiliaries), or analytic (*i.e.*, Does it use prepositions freely and form its tenses with auxiliary verbs)? As a general principle the synthetic will be the older; at all events, the answer will set at rest the relationship so far as that an analytic can never be the parent of a synthetic tongue, whilst all analytic tongues are the children of previous synthetic ones. If, however, we find the resemblance, although unquestionable, yet so remote as to render it impossible for us to include them in the same genus or perhaps even class, we must carry our enquiry further and see whether the fundamental principles of grammar agree, and how. Here, then, are two main points: 1st, The position of the predicate; 2nd, The nature of the copula. If they agree in these they are of the same family; if they disagree they are not so. Our last step, then, is to enquire if one or the other be truly inflected or merely agglutinated, and the answer here will enable us finally to place each in the grand division to which it belongs.

Returning now to the vocabulary, I would request you to bear in mind that all words are not of the same value for comparison. It

\*Vide Max Müller, Lectures on the science of Language. 1st Series.



would, for instance, be less important to find the same words for luxuries, or scientific terms in two languages, than it would be if they were names of primitive ideas, such as "water," "fire," "food," "sun," "moon," "man," &c., or the numerals, personal pronouns, and auxiliary verbs. These are almost always retained, however much the vocabulary may vary otherwise. Thus in English, the Norman element, which has influenced our vocabulary generally to so great an extent, has had no effect whatever upon our numerals, (EXCEPT SECOND), pronouns, or primitive verbs which are still Saxon as before. So, when we find such words as "Captain," "General," "Emperor," and the like, in languages so different as English, French, and Russian, we should not be entitled to say they were of the same group, though we found hundreds of such resemblances. These words not being primitive ideas, are most likely borrowed from a common source; but when we find such words as "water," "fire," "man," &c., the same in English, German, Dutch, Danish, &c., we are entitled, almost certainly, to refer them to the same group. When, in addition to this, we find the numerals and the pronouns alike, the certainty becomes as great as it can be, without taking into consideration the rules of grammar.

If we do not find the words in common use for primitive ideas the same in two languages, it does not necessarily follow that they are different, although divergent. The root which exists in the one may have been lost in the other, but may still be recoverable, if we can only trace the history of the tongue far enough back. Thus "fire" in Italian is "fuoco;" in Russian it is "агунъ." Here the difference appears hopeless, till we go back to the parent of the Italian, the Latin, and there we find the same root in "ignis." Again water in Greek is ὕδωρ, in Latin "aqua." But we find in the word "sudor," sweat, the Greek root in a slightly modified form, whilst the Latin one re-appears in the Persian "ab" and the Sanskrit "apa." Again, in the Sanskrit, the word "des," land, (still used commonly in Bengali, but less commonly in Hindustani) re-appears in the "Irish" "des," but seems to be lost in the other languages except as a compound, as in Greek, the termination *της* in such words as *Histiaeotis*.\*

Words again may become changed in meaning from several causes. Either the original word becomes gradually confined to a part of its meaning only, rendering the use of a cognate word necessary to express the first meaning; or a portion of a compound, or a phrase may be dropped in process of time, leaving the portion that remains inexplicable. Thus, as an example of the first, the Spaniards use the word "hermano" to signify brother, although the original Latin "germanus" meant first cousin, as it does with us at the present time. This arose from the word "frayle," (from *frater*,

\**Vide* remarks in Pocock's *India in Greece*.



fratellus) having come to signify a brother of a religious order, a friar, in short. It was then necessary to take another cognate word to express the original idea. As an example of the second mode of change, we may take the Italian word "troja," a pig, a word which exists in French as "truie," a sow. Here, etymology is completely at fault, until we discover *historically* that it was originally "porco di Troja," which meant a stuffed pig for roasting, and which got its name from a reference to the famous *stuffed horse of Troy*! This example was cited by the late Sir G. C. Lewis, to show how it would be impossible to decipher an unknown inscription in a lost language. He was so far right, that we have hitherto failed to decipher the Etruscan, to which we had no key, but the example he aimed at was the Egyptian, and there it did not apply, as we had the Coptic to start from.

This loss of words and roots is less marked in the Semitic tongues, but it reaches its acmé in the Turanian. Here, not only words but whole languages disappear in a single generation. This is notably the case among the American Indians, where, since the discovery of the new world, more languages have probably *disappeared* than are now spoken over the whole earth! Of the tongues of the six nations who fought on our side in the American war not ninety years ago, not a trace remains. Humboldt mentions having seen an old parrot in South America that spoke a language which had become entirely extinct. Various causes contribute to this strange state of things, the chief being the nomadic or wandering life of the people, and the utter want of a literature to fix the tongue. Another curious cause is referred to by Max Müller as prevalent in Tahiti, where it is considered etiquette to drop all words which *resemble even* the name of the reigning monarch. Sometimes only a syllable is dropped, sometimes the whole word. "It is," says Max Müller\* "as if on the accession of Queen Victoria it had been agreed to drop the word victory and use triumph instead, or to cease to speak of Tories and call them Liberal Conservatives." You will easily understand how rapidly a language must change which is made the victim of such strange vagaries. It is this vanishing of roots, words, and tongues that has made the study of the Turanian language so difficult and their classification so imperfect. Of course where a literature exists, as in Turkish, Finnish, Hungarian, &c., the language becomes fixed, although it retains its Turanian form.

These considerations will show the weakness of mere word comparison as the basis of linguistic science, and will prepare us to receive the more readily the aids which can be afforded by the study of grammar.

To examine these in detail would demand more time than could be at present afforded, and it will suffice to take one or two salient points. The fundamental points to which I have already referred

\*Lectures on the Science of Languages, 2nd series.



are, 1st, The position of the predicate; 2nd, The nature of the copula. Now in the Turanian languages the connection of the different members of a sentence is decided by their proximity without any special reference to declension, case, mood, &c. Thus, as Bunsen has expressed it,\* a Turanian would say in reference to the action of striking, "strike" as the first idea; secondly would come the idea of the individual who strikes, "I;" so his first phrase would be "strike I." Next, the time would present itself and would naturally be measured by *light*; so the idea would be "light that is," or "this light;" hence the phrase "strike I this light" for the present, "strike I that light" for the past. To a people dependent so far upon juxta-position for expression, such a thing as obliterated or even concealed declension would be intolerable; so that a substantive verb like the Hindustani, which has but one word for the 2nd and 3rd persons singular, and again but one for the 1st and 3rd persons plural, would be unendurable. Let it be observed that this does not touch the subject of *vanishing roots* before referred to, as the roots or words are there conventionally lost; it refers only to the form of expression.

What the Turanian would express by mere agglutination the Aryo-Semitic family would express by inflections and by a more or less elaborate syntax. Here comes the significance of the predicate and the copula. The predicate is that which is said about or which qualifies or limits a subject. The copula is that which binds together the members of a clause or sentence. Thus to take the sentence we have already employed, "John's letter demands attention." "John's" is here the predicate and precedes the noun or subject, as it does in almost all the Aryan tongues not resolved by progressive analysis and the interpolation of prepositions. This, translated literally into Latin, it would be "*Johannis literae attentionem exigunt.*" Here "*Johannis*" is the predicate. So in Hindustani (which I prefer to take as being both a good example and a spoken language, familiar to many), it would be "*Yahiye-ki chithi lihaj mangti-hai.*" Here also "*Yahiye-ki*" is the predicate. This precession of the predicate obtains in nearly all the Aryan tongues; and is indeed one of their chief distinctions. On the other hand, in the Semitic the reverse is the rule. Here, the predicate follows the subject. Thus let us take a name of most common occurrence in Arabic,—Abdallah. This means "servant of God." But had it been an Aryan tongue, it would have been "Allah Abd," "God's servant," "Dei servus." In Greek it becomes "Theodoulos," where the predicate "Theou," God's, precedes the subject "doulos," servant. In Hebrew the same word is "Abdeli." Similarly, if we analyze any compound Hebrew word, we shall find this arrangement: "God's house" becomes "Bethel" or "House God's." Numerous other examples might be cited, which would, I think, be sufficient evidence for the majority of people. Some, however, have opposed this view,

\*Outlines of Universal History.



and have instanced certain cases in which an Aryan tongue uses a Semitic form. As for instance, in Greek the word ἵπποποταμός means literally "horse river" instead of "river horse," Ποταμιππος as it ought to be. This certainly appeared a curious exception. The deciphering, however, of the Egyptian (which is a pre-Semitic tongue), showed that ἵπποποταμός was only a literal translation of the Egyptian word, whose form was of course Semitic. This precession of the predicate obtains however to a certain extent, as I shall have occasion to mention, in the Celtic tongues. With regard to the second point, the nature of the copula, it may perhaps be less easy to render clear to an Aryan audience the peculiarity of the Semitic tongues, as we are so much accustomed to the, apparently to us, *necessary* presence of the substantive verb in order to complete the sentence. That this is, however, an Aryan peculiarity, I shall proceed to show. When we say "man is mortal," man is here the subject, mortal the predicate, and *is* the *copula*. If instead of Aryans, we were Semites, we should say "man he mortal," that is we should use "he," the personal pronoun as the copula. Now this may seem very extraordinary to some of you; but I would ask you to take up your Old Testament, a book translated out of the Hebrew and the Chaldee, two Semitic tongues, and you will find that whenever "is" occurs—provided it be not a part of a tense of another verb—it is printed in *italics*, showing that it has no existence in the original tongue. Taking at random any chapter, I find "I *am* this day King of Israel;" original, "I this day &c." "Thy servant *is* come;" original, "Thy servant *he* come." "I *am* this day fourscore years old;" original, "I this day, &c." In every case, unless conjoined with a participle of another verb, the substantive verb has to be supplied. This, however, is not to be construed into a total absence of a substantive verb, because there is one, *kan*, to be, which is used in certain emphatic phrases, but when used it is more a rhetorical than a grammatical form, and quite apart from the nature of a copula. I may illustrate this peculiarity of the Semitic tongues, from a language spoken in our own dominions at the present day, and at no great distance. I mean the Maltese. This language, with its vocabulary enriched from the various languages of Europe, is still entirely a Semitic tongue; so much so, that a Maltese can make himself understood with facility to an Arab of Africa, or *vice versa*. In this tongue the Semitic forms are well preserved. Suppose we ask "What book is that?" We should say "Xi ctieb hu dac?" Here there is no substantive verb; *hu*, the copula, is the personal pronoun, *he* or *it*. Or again "Where is your book?" "Fein hu il ctieb tighech?" Where is *he* the book your? or, "This is of gold," "Dina hu tad deheb," "This *he* of gold." Let us now take another sentence "The master is in his house." This, in Arabic, would be rendered by "Fi id-dar sahib ha." "In house master his." It will thus



be observed that the form of the sentence is as it were reversed. This will be perhaps better seen if we take the sentence we have already used: "John's letter demands attention," in Latin "*Johannis litteræ attentionem exigunt*;" or in Hindustani, a language of our own dominions, "*Yahiye-ki chithi lihaj mangti hai*," "John's letter attention demands." In a Semitic tongue this would become "demands attention letter John's." It will thus be seen that with the Semites the order of thought is 1st, The verb or copula, 2nd, The object, 3rd, The subject, 4th, The predicate. With the Aryans the reverse:—1st, The predicate, 2nd, The subject, 3rd, The object, 4th, The verb and copula. The paramount importance of the verb with the Semites is evident from the fact that every root in their tongues is a verb, the 3rd person singular, of the preterite tense, whilst on the other hand among the Aryans the roots are almost invariably nouns.

I have prepared a few examples of sentences in Aryan tongues for comparison,\* and there you will see, in the first place, that the Romance languages—French and Italian—are closely related to each other and both to the Latin. It would, of course, require a more profound study of the subject to detect the synthetic form of the latter in contradistinction to the analytic form of the two former. Again it will be evident that the three Celtic are closely related, as are also the seven Slavonic and the ten (including the Scotch and English) Teutonic. We can thus safely say that each group of tongues had, or *most probably* had, a common origin. To go back further and see whether the parent or typical tongues of these groups can be referred to one more remote, we must examine and see whether we can trace any community of roots. Between the Celtic and the Italic we can do so at once in the name of God which is *Deus* in Latin, *Dia* or *Duw* in the Celtic. Again between the Celtic and the Teutonic there is a connection in the Gothic *Dhindos*, the Anglo-Saxon *Dhioder*, and the Irish *Daoine*. In the Slavonic the word *krow*, blood, is evidently the same root as *cruur*, the Latin for gore or clotted blood. Thus we see even in this one sentence clear inter-connections between all the groups; in addition, the numerals are almost identical, and the grammatical and the syntactical forms are nearly the same. With such evidence as this—and it might of course be vastly extended—before us, we may I think look back to a period when those tongues were still one before the various members of the family separated, and each took his own road and commenced to develope his own peculiar idiom. This is the tongue which is supposed to have existed, and which has been called the Aryan. In a similar way it could be shown that the Semitic tongues might be referred to a common origin.

But we can go even further, for, finding certain primary roots, such as *earth*, *heaven*, &c., present in both Aryan and Semitic tongues, and also certain languages, which, partaking of the grammatical forms of both families, yet differ from them and are evidently older, we are led to

\*See page 25.



the consideration of a period when even those venerable tongues were young, and consequently to the conclusion that they must have had a common root from which to spring. This brings us back to the time of the definite settling of the inflected class of tongues. Beyond this it becomes more difficult. It can, however, be shown that even in the Turanian tongues, with their ill settled forms and the vanishing tendency of their roots, traces can be seen of a community of roots not only among themselves, but also with the inflected languages. Some words indeed appear to have been common to all mankind and to have existed in the most remote ages. Curiously enough one of the most remarkable is the word for *goose*, which appears to be present in a more or less modified form in almost every language of the world. In English it is *goose* or *gander*, in German *gans*, in Latin *anser*, in Sanskrit *hansa*, the same in Cingalese and Burmese. In all the tongues of the Turkish stock it is *kas* or *gas*, and so on. We are already accustomed to look upon the goose as an historic bird, from the famous geese who saved the capitol of Rome from Brennus and his Gauls, and we have been taught that on that account they were held sacred ever after. But it is generally forgotten that those very geese that gave the alarm were already sacred, being kept in the Temple and having been spared from destruction, even when the garrison was reduced to great straits. It is therefore certain that the consideration in which the bird was held was of a much older date than the Gaulish invasion, and this is, I think, the more clearly proved by the almost universal presence of the name.\*

If, now, we are entitled to look back to a time when the Turanian and the inflected languages were one, it must have been a time long ere the two classes divaricated and before the one acquired the power of agglutination or epiphraasis and the other that of inflection. At such a time the vocal means of communication between members of the primeval family must have been limited to necessities only, and obviously confined to monosyllabic utterances. Number, beyond the idea of two or perhaps four, could have had no existence, as at the present time among the Bosjesmans and some other very primitive savages. Pronouns were as yet unknown, as man had not arrived at the conception of subject and object, and probably spoke of himself as a child does, in the third person and objective case. This is the state of language to which I have given the name of the *Archaic*, from *αρχή*, the beginning.

Where then did the primeval men who spoke this Archaic tongue dwell? All the traditions of the European races, as well as what history we have of their early migrations, point to Asia as their starting point, or at least to the eastward of their present homes. The Greeks certainly used to boast of being *autochthones* or native-born children of the soil, but their mythology, many of their traditions

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\*See Sir J. Emerson Tennant's Ceylon.



and the opinions of some of their own greatest philosophers prove such a notion to be the mere offspring of national vanity. All the Semitic and even the Egyptian traditions point to the valleys of the Euphrates and Tigris as their original seat. Among some of the African tribes a tradition, I believe, exists of their coming from the North. The Hindus we know historically to have been trans-Himalayan. The American tribes all, or almost all, believe they came from the North, the high road to Asia. Lastly, even the Chinese have shadowy traditions which place their origin to the West, toward the centre of the continent of Asia. When after a lapse of time the maxims of Confucius were becoming forgotten, and a period of religious anarchy occurred, a tradition still remained that the true faith was to be found in the West, and an emissary was despatched by the then emperor to seek that faith. This messenger arrived in India, where at that time the religion founded by Gotama Buddha—and afterwards supplanted by Brahmanism—was flourishing vigorously. This he conceived to be the true faith, and having made himself master of the wanderings and virtues of Buddha he returned to China, where he published these in Chinese, and where the Buddhist faith reigns to this hour. The full details of this interesting episode have only recently been brought to light by the labours of M. Stanislas Julien, who has devoted more than 20 years to the task of translating, I might almost say *extenebrating*, the wanderings of Fo (the Chinese word for Buddha) from the Chinese back into the original Sanskrit. This process was absolutely necessary to the understanding of the matter, as the manner in which foreign names alter in Chinese renders them helplessly obscure, without a systematic restoration. This arises from various causes, such as the absence of the letter *r* and the incapability of the Chinese to pronounce or apprehend except as separate monosyllables. I have already mentioned that Buddha with them became Fo, but this is only one of a thousand examples.

Taking then all the various traditions together, aided by what we have in the way of history, we may conclude that some part in the centre of the continent of Asia was the original seat of primeval man, and it would appear that either the valleys of the Euphrates and Tigris, or perhaps more probably what is now called Independent Tartary, and what was anciently known as Ariana and Bactriana, was the cradle of the human race. There sprang that "Wondrous being, the Lord and king of nature all, whose large and arched brow sublime, of wisdom deep declared the seat."

We must picture to ourselves this primitive Archaic people, few in number, leading their wandering life in the fresh bright morning of a virgin world. Their wants were few, so must their tongue have been limited. For numbers of years, probably centuries, perhaps thousands of years, after speech had been given to man, monosyllabic utterances were all that he could have used, juxta-position of words



alone indicating their connection and inter-dependence. The life was probably patriarchal and nomad over the vast plains of Central Asia. At length a branch separating from the Archaic stock departed to the eastward, and arrived at last in a smiling country, well watered with rivers and teeming with verdure. Here they settled themselves and called the land *Sin*, which we have since called China. The beauty of the climate, the fertility and productiveness of the soil, and the absence of the extreme vicissitudes of temperature which characterised their former home, were all highly favorable to fecundity of race, and the rapid developement of an early civilisation. But they had carried their Archaic tongue along with them, and civilisation having as it were overtaken them before their language was developed it became fossilised in monosyllables and remains so to this day. They soon acquired the art of writing, first symbolic or hieroglyphic, but in later times the characters have become so modified as to have lost in great measure their pictorial character. This, the earliest civilisation, Bunsen designates the Eastern polarisation of Sinism. The remains of the Archaic stock, which I have designated the Koinic, or that which was common to the rest of the world, must have soon after begun to divide. While one portion continued the nomadic or wandering life of their forefathers, another had probably begun to feel the advisability of working together in a common interest, and in fact took the first step towards political union. The former have been styled the Turanian or Nomadic, and the latter I have called the Demic or Political. The change, it is probable, first took place in the language. The Demic branch felt probably the difficulty caused by the tendency to change in the Turanian roots, the result of the patriarchal life, and united themselves together in a community larger than that caused by mere family ties, and this alone tended to the fixing of their word roots. Soon inflection must have followed, probably dependent originally on mere juxtaposition, but rapidly getting beyond it as the Demic mind expanded. The Turanian, on the other hand, stuck to his agglutination, beyond which he has hardly got to this day.

Soon after the division, a branch seems early to have separated itself from the main Demic stock and set out to the west to seek fresh fields and pastures new. A congenial spot they found on the banks of the mighty Nile, a rainless country, but wondrously productive, irrigated as it was by the great river. Here was found the second great civilisation of the old world, and this is called by Bunsen the western polarisation of Khamism.

Here, too, the art of writing was soon acquired and was at first symbolic or hieroglyphic. By and by the pictures became less distinct and a second form called the Hieratic came into use. This corresponds in a great measure to the Chinese writing at the present time. But, whereas the latter stopped at the second stage, the Egyptian went on further and produced a current hand known as



Demotic or Enchorial. All these, however, have passed away with the civilisation, and the Coptic, which is now the representative of the old Egyptain, is printed and written in Greek characters.

In the Egyptian are found grammatical forms partaking of both the Aryan and Semitic, but are themselves of an older, type, indicating that it must have come off from the common stock previous to its division.

That which remained I have called the Euphratic for convenience, and we shall leave it for the present to follow the fortunes of the Turanian family.

Those wandering hunters becoming at length, like a swelling sea, too mighty for its bed, flowed over in successive waves wherever necessity or the spirit of adventure urged them. In search of new hunting grounds some went to the rising, some to the setting sun; some were driven to the ice-bound north, others penetrating at length beyond the hills, whose summits seemed to reach to heaven, spread themselves far and wide over the sunny plains of India. In every part of the world they appear to have been the first to tread the virgin soil, excepting China and perhaps Africa. In Europe we find traces of them to the present day either in history, in antiquities, or in the actual presence of their descendants.

There seem to have been four branches at least. The Iberian we know in historic times occupied the whole of the Spanish peninsula and the south of France; and the Ligurians and Siculi occupied a considerable portion of Italy and the whole of Sicily. Incursions of more powerful nations gradually reduced them to the small patch of the Basque people who call themselves Euscara and their language Euscaldunac, and who occupy the two slopes of the Pyrenees and immediately adjoining land.

The famous Etruscan or Tyrrhenian race appears to have been also Turanian, but of this we cannot be certain as the inscriptions in their language have as yet baffled the efforts of archæologists.

Another branch is still represented by the Albanians, whose language, like the Basque, was long a puzzle, situated as it was like a boulder of another formation in a stratum of comparatively recent tongues.

The last branch was the Finnic, still represented by the numerous races of northern Europe, and in a later form by a noble and heroic people, the Hungarians. The incursions of this race, known in history as the Huns, was the last successful attempt of the Turanians to penetrate to the west of Europe. Their power was broken and the tide of invasion rolled back at Châlons-sur-Marne by Clovis and Aëtius. Before leaving the Finnic branch I may mention that it has been recently discovered that the Finns possess in their language, one of the most splendid epics the world has produced, worthy to rank, it would seem, with the Iliad, the Mahabharata, the Niebelungen lied, and the Roman de la Rose.



The Turanians who first spread to the East, driven on probably by advancing Tunguses, Samoiedes and Mongols, found their way by Behring's Straits to the American continent, and succeeded in establishing an early civilisation, whose remains we see in the ruined cities of Central America. Upon this the civilisations of Mexico and Peru were a recent superposition.

The great Malay branch, passing to the South, probably urged forward by the Lohitic and Taic races, peopled first the Eastern peninsula, and subsequently spread over the Archipelago, Australasia, and Polynesia.

The present inhabitants of Thibet, the Himalaya ranges, and the Eastern Peninsula, appear to be of a more recent age than the Malays.

The great Dravidian branch which crossed the Hindu-Kush, and the Western Himalayas, established themselves in India proper, and in Ceylon. Though overrun by the Hindus and Mohammedans, they are the most numerous inhabitants of the Madras country under the names of Tamuls, Telingus, &c. In Bengal, however, they linger only as isolated hill tribes, such as those mentioned on the table, the Khasiyas, the Ghonds, the Santhals, with whom we had a war about ten years ago, and some littoral races, as the Uriyas of Orissa, and the people about Chittagong, some of whom go naked, are cannibals and live in trees. They are still represented too, by the degenerate Veddas of Ceylon. A most curious and interesting branch are the Coles, from whom the modern name Cooley is derived. These Coles appear to have been more than a mere branch, and it is a question whether the name did not originally designate a large section of the Turanian race, for traces of them are found in widely separate regions. Doubtless our old friend King Cole was one of them, and his name still remains in some districts, as for instance Coil or Kyle, and Coilsfield, in Ayrshire, as well as in many other parts.\*

The great Tataric branch spread itself over central Asia, and succeeded as the Mongols and Mantchus, in the 17th century, in making themselves masters of the Chinese throne, whilst the Ouigours in the west gradually extended their incursions, until at length, in the fifteenth century, they penetrated to Europe, and under the name of Turks or Osmanlis, overthrew the empire of Constantinople. So great was the terror they inspired that from their name Ouigour comes the word *ogre* in use at the present time, and, as late as the beginning of the last century, hymns were written in which the petition "From Pope and Turk defend us Lord," was frequent. Indeed Europe had no small reason to fear them, and it was only at the end of the 17th century that their attempts on Central and Western Europe were arrested by the brave Sobieski and his gallant Poles, a debt to that noble people which Europe appears to-day to have conveniently forgotten.

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\*See an interesting paper by Dr. Chevers, in the Calcutta Review for 1858.



We must now turn back to the Euphratic race, which was destined in most cases to wrest from the Turanians their fairest possessions. Probably the first change was the separation of the Kushic or Babylonian and Assyrian stock, and their settlement in the Euphratic valley. These tongues present peculiarities of structure which are evidently pre-Semitic but posterior to the Khamitic. It is here the place to speak of the African races. It is generally agreed that they cannot properly be considered as Turanian, as their dialects present appearances of inflection. Their grammatical forms are peculiar as they place the predicate before the subject like the Aryans, but use the personal pronoun as the copula like the Semites. It is therefore probable that they belong to the Euphratic stock, having separated from it before the division into Aryan and Semitic.

Soon after the departure of the Kushites and the Berbers, the Aryo-Semitic branch finally split. Although to both the vanishing roots (what may be called the *marantorhizal* condition) of the Turanian stock were intolerable, yet the Aryan found himself too much confined by the rigid retention of roots or *phanerorhizal* tendencies of the Semite, and had resort to fusion and concealment of roots or a *cryptorhizal* etymology, which was reciprocally offensive to the Semite. So each went his way, the Aryan with his verbal copula and preceding predicate, the Semite with his succeeding predicate and pronominal copula. The history of these two families is the history of the world. Their characteristics were as different as their tongues. In the Aryan, the intellect reigned supreme, giving birth to science, logic and philosophy : in the Semitic, imagination prevailed and gave rise to all the religious movements which have benefited or convulsed the world.

The Semitic family has much fewer branches and fewer members of them than the Aryan. Three main stems can be made out. The Hebraic, the Aramaic and the Himyaritic. The first, the most interesting, includes the Jews, the Phœnicians and the Carthaginians, or Punic race. The second, the Aramaic, included the Syrians and the Chaldees, a branch of this language being the one used in Palestine at the time of our Saviour, as is proved by the sentences recorded in the Evangelists. This branch is considered to be represented at the present day by the Nestorian Christians in Kurdistan. The Himyaritic branch included the Arabic and Amharic or Aethiopic races, the former of which is the dominant Semitic race of the present time, while the latter peopled Abyssinia and the countries bordering on Egypt.

We may view the Assyrians and Babylonians as belonging to the Semites, as they are most nearly allied to them, although properly pre-Semitic. If we do so, then we may consider three great struggles for the mastery of the world, as having taken place between the Semites and the Aryans. In each case the Semitic power blazed up with spasmodic brilliancy, and appeared ready and able to consume every-



thing before it, only to sink in each case as rapidly as it rose, before the steady advance of the Aryan race. The first epoch closed with the extinction of the Babylonian Empire by Cyrus, after which no Semitic power of note came into prominence for some centuries. The Greeks, save some paltry contests with the Phœnicians, never encountered any Semites.

The next great stroke for empire was made by the Carthagenians, and for a time the fate of the Aryan race seemed sealed. But Hannibal's meteoric light paled when Hasdrubal fell at the Metaurus, and Carthage was blotted out from the face of the world.

A lull of well nigh nine centuries followed, till the Saracens having conquered Syria, Egypt, and Northern Africa, and having overrun and subdued Spain, crossed the Pyrenees and ravaged the South of France. The fate of Europe trembled in the balance; but again the Aryan prevailed, and at Tours, Charles Martel slew Abdalrahman and destroyed the Saracens, but for which victory, as Gibbon remarks, the Koran might now be taught at Oxford, and the muezzin call the faithful to prayers in the heart of London. Since that time, if we except the Mohammedan impetus given to the Osmanli invasion in the fifteenth, sixteenth, and seventeenth centuries, and to the Persian invasion of Hindustan in the eighteenth, the Semites have been more employed in holding their own than in attempting the conquest of other countries. Their influence, however, in a more peaceful form is extending rapidly in another direction, and Mohammedanism bids fair at no very distant period, to be the universal religion of the African continent.

We have now to consider the great Aryan family—that numerous and mighty race which seems destined to rule the entire world. Soon after it became a distinct family, a branch shot out from the parent stem to the westward. That branch was the Celtic. Three considerations render this early origin probable. First, The Celts evidently preceded in Europe everybody except the Turanians. Secondly, There is evident in the language a tendency to non-Aryan forms, such as a hankering after putting the subject before the predicate. Thirdly, Their are in it certain roots and forms not to be found in a later than a pre-Semitic tongue, requiring us to go back even to the Egyptian itself. Then the course of its wanderings can be traced out by the names it has given to rivers, mountains, and valleys, which have survived centuries of conquest by the most divergent peoples. For a long time the claims of the Celts to be considered Aryans were disputed, but Prichard and Pictet have put the matter beyond doubt. The Celts early divided into two if not three branches. The Ossethic branch is doubtful. Of what the Sarmatian and Alan tongues were like we know little, but the modern Ossethic is said to bear a certain resemblance to the Celtic. I have therefore ventured to put this branch, although with hesitation, as a possible member of the Celtic family. The other two branches



however, are the more interesting to us. The southern or Gaodhoilic Celts, appear to have moved westward first, occupying successively Greece, Italy, and France, as well as Western Germany. In all these countries they drove out, more or less completely, the Turanian races. The vigorous Iberians of the Peninsula, however, proved a match for them, and they only effected a partial lodgment there. From France they passed accross to Britain, the greater part of which they occupied, as well as Ireland, in pre-historic times. Here we must leave them for a little, and follow the Kymris, or northern Celts. These, alluded to in Scripture under the name of Gomer, passed through Southern Russia, giving their name to the Crimea, across Eastern Germany to the country between the Elbe and the Vistula. Here they gave their name to the Cimbric Chersonese, and appear to have divided into two streams. One pressed to the westward and occupied all the country to the Seine, driving out their Gaelic kinsman. They then crossed the sea and speedily overran the whole of Southern Britain, driving out or absorbing the old Gaels. They are still represented by the Welsh and the Cornish, the latter extinct as a spoken language only eighty years ago. The second stream went northwards and occupied the Scandinaviau peninsula, where they probably mingled with the Finnic race, as their stature undoubtedly deteriorated. From Scandinavia they passed after a time across the seas and overran Scotland as the Picts.

Returning to the Celts in Gaul, we find that the pressure of the Kymris drove many of the Gauls south into the Iberian country, from whence they were expelled, and taking ship, landed in Ireland under the name of Scots. They overran the whole of that country, and afterwards passing into Scotland, not only overcame the Picts, but blotted out both their name and language and imposed their own upon the country.

Three interesting points have been decided of late years, by the examination of the Celtic tongues. The peculiarity presented by them, notably the Gaelic branch, in having no neuter and many of their feminine nouns of the masculine gender, as well as the phenomenon of eclipsis, seemed to remove them far from the Aryan stock. But Zeuss, the great German writer on the subject, discovered that the most ancient Irish manuscripts were to be found, not in Great Britain or Ireland, but in Switzerland and Italy. This will be easily understood when we consider that Ireland, the Island of the Saints, was the great seat of learning in the dark ages, and that from it missionaries proceeded to all parts of Europe, instructing the people and founding monasteries in various places. Among others they founded establishments at St. Gall and Milan, and there were Latin manuscripts discovered, with glosses in native Irish. This proved to be a much older form of the language than any previously known, and in it was found a true neuter gender, whilst the phenomenon of the feminines becoming masculine arose



from their having been originally neuter—as they are in modern German—the neuter gender becoming gradually lost and its place supplied by the masculine as in the modern Romance tongues.

For long the true nature of the ancient Gauls was a moot question, but within the last ten or twelve years, several inscriptions have been discovered in the Gaulish language, which can be interpreted only through the Irish—proving incontestably that it belonged to the Gaelic branch. Lastly the Picts, whose tongue had disappeared, with the exception of one word, have been held by some to be Teutonic; but lately an inscription, which appears to be Pictish, has been deciphered, and proves undoubtedly to be of Kymric character.\*

The remainder of the Aryan race, which I have named the Eurasic, probably divided into two, the Europic and the Asiatic, so designated from their subsequent geographical position. The Asiatic divided again into two main branches, which were probably earlier in their civilisation than any of the Europic. The one the Iranic, whose chief representative was the Persian, was destined to go through many vicissitudes—first to overthrow the Semitic power in Asia, to succumb afterwards to the Greek, then after a second brief period of independence to fall in its turn before the Semitic power of the Caliphs. The Persian language shows in itself the evidence of these successive changes. As the original sacred language of Zoroaster, the Zend, it is the first we have met with of the great synthetic class, although, unfortunately, little of it has survived. In the form of the Pehlevi, it was the spoken language of the Achæmenian period. Since the Abasside conquest it has become loaded with a Semitic vocabulary, and even partially charged with Semitic forms, both of which it carried into India,

The other and more important branch for us, the Indic, is confined entirely to the Peninsula of Hindustan. Starting from the valleys of the Hindu-Kush, the Hindus appear first to have penetrated into Northern India some fifteen or sixteen centuries before our era,—a numerous and vigorous race, speaking Sanskrit, and having already made some advance in arts and sciences. Their religion was Brahmanism, but apparently not the idolatrous faith of later times. They soon drove the Turanians to the south and into the hills, and established themselves over the whole of the north. There appear to have been several kingdoms, either contemporary or successive; Delhi, Allahabad or Prag, Kanauj, Patna, and Rajmahal were the different capitals. The Sanskrit gave way in time, and passed from its synthetic stage through the Prakrit and Pali, until it became broken up into the analytic tongues of modern times. Similarly the religion became corrupted, and more and more overlaid with idolatry until about the sixth century the great reaction of Gotama Buddha took place and Buddhism became the dominant

\**Vide* Paper by Mr. Skene on the Newton Stone. Antiquarian Society (Scotland).



Indian faith. This was the faith when the Pali-speaking Bengalis, under Wijayo, sallied forth to the conquest of Ceylon. By the time, however, of Alexander the Great and his successor Seleucus, the older Brahman faith had again obtained the mastery, and Porus, who opposed Alexander and the King of Kanauj, who was overthrown by Seleucus, were both Brahman monarchs. The magnificence of the ruins, the vastness of their cities, and the wonderful copiousness and richness of their language and literature, attest the splendour of those early Hindus, and it would be difficult to believe that the mean and sensual Bengali could be the descendant of such a glorious ancestry, had we not their counterpart in the Greek of the present day. The parallelism between the two races is indeed remarkable. Both languages are copious and synthetic in the highest degree. Both races had carried art, as represented in sculpture and architecture, to a pitch of unrivalled perfection. Both made rapid and marvellous strides in the physical sciences, and they are the only two races of the world who have founded independent systems of logic. Finally, as both were mighty in their prime, so are they low in their decadence, the one still under the foot of a conquerer, the other owing to the charity of the stranger what it possesses of a weak and futile independence.

The Europic stem divided early into two great parts, the Classic or Pelasgic and the Barbaric. To these may be added the Scythic, now extinct. It is to linguistic science alone that we owe the settling of the position of this race, for it is from an examination of the few words left in the Greek historians that we are able to say that they were an Aryan race, which has left no direct descendants, but which was probably closely allied to the Lithuanian.

The classic division comprehends the Italic and the Hellenic. Of the latter the Greek alone remains; the other tongues, the Lycian, Carian, and probably also the Phrygian and Lydian, became extinct before our era. In comparing it with the Sanskrit, I have already spoken of the Greek, and it will suffice to remark that it has retained in later times its synthetic form more perfectly than any other language. Probably for this reason it has produced few or no descendants. The Latin, on the other hand—which soon swallowed up the other Italic tongues—had, even before historic times, commenced to pass from the synthetic to the analytic stage, as evinced by the difficulty it had in forming compound words. Probably for this very reason it lent itself the more easily to modern requirements, and became the parent of a numerous and distinguished progeny.

This, of course, is not the place nor have we time to examine the different theories of the formation of the Romance tongues, but I may state generally that no one doubts now that they are direct descendants from the Latin, without any intermediary form. This is proved by their closer inter-resemblance as we approach the parent stem. A monkish writer mentions that an Italian priest of the time



of Charlemagne, meeting a Spanish pilgrim in Germany, understood his language *because he was an Italian* (ejus linguæ, eo quod esset Italus, notitiam habebat)\* thus proving that the Spanish and Italian in those days were not so different as they are now. In Spain and Italy, where the Celts were few, the language has departed least from the original type, but in France we can still trace their influence. This is peculiarly shown in the numerals, where the Italians say *settante*, the French say 60 and 10, and where the Italians say *ottante*, the French *fourscore*. This is distinctly a Celtic form, the Gaëls having no separate words for their numerals, and counting by scores and tens.

The Wallachian, again, being far separated from the Romance world and hemmed in by Teutons and Slaves, underwent numerous changes, one of the most curious of which is the change of the guttural into the labial consonant—thus, *lingua* becomes *lembe*, *quatuor*, *patro*, *quinque*, *pempe*, &c.

Lastly, the Barbaric division comprehended the Windic and the Teutonic. These races appear to have arrived in Europe from the north-east almost simultaneously, the Teutonic probably slightly preceding the others. The Lettic branch of the Windic is peculiarly interesting, as it appears in the old Prussian to approach more nearly to the Sanskrit than any of the other Aryan tongues. It comprehends the languages spoken in the Polish provinces of Russia, that spoken in little Russia by the peasantry, and the old East Prussian, now extinct. As before mentioned, it is possible that the extinct tongue of the Scythians was closely allied to this branch.

The Slavonic branch may be divided into two, the older or Palæo-Slavonic, or the newer or Neo-Slavonic. For a long time these races were held in subjection, and the word *slave* in later times has come to mean a servant of servants. The Palæo-Slaves, including besides those marked on the diagram, the Polabians, Lusatians, Slovacks, Croats, Illyrians, &c., are probably the deposit left in Europe by the Vandals. Their power, after a momentary flash of splendour under Genseric, was extinguished by Belisarius, and they have never since risen to prominence, except in the case of Bohemia.

The Neo-Slaves, however, comprehending the Poles and the Russians, have already made for themselves a name in history, and are doubtless destined hereafter, to exercise a strong influence on the fate of the world. Although in every contest they have as yet succumbed to their brother Aryans, still the victories have cost so dear, that a time may come when we shall exclaim with Pyrrhus, "One more such victory, and we are undone."

The last, and to us the most interesting group, is the Teutonic. What remains we have of its early tongues, prove them to have been highly synthetic. They have, however, all become analytic in

\*See Sir G. C. Lewis' Essay on the Romance Languages.



modern times, the German alone retaining its original synthetic power in anything like perfection. An exception, must however, be made in favour of the Islandic, where early colonisation a thousand years ago fossilised the primitive tongue. The three divisions of this group are the Scandinavian, the High Dutch, and the Low Dutch. Of these the High Dutch, represented by the modern German, is probably the most recent. This, however, is a point very difficult to settle. The Scandinavians came into Europe across the north of Russia, and drove out the Picts and other Kymris from the peninsulas and islands. This doubtless caused the Pictish invasion of Scotland. A thousand years ago the Scandinavian tongue was one, now represented by the Islandic, but gradually dialectic differences have become more and more marked, until we have now three spoken languages, besides the dialect of the Faroë Islands, and the extinct tongue of the Orkneys. Those mighty men of the north, the patricians of the world, as Bulwer Lytton rightly calls them, finding a congenial home on the ocean, spread terror over Europe, conquering and leaving an undying remembrance of themselves in every country they invaded. As men they were perhaps the grandest specimens of nature's handiwork, and they regenerated Europe by high-mettling the blood in the veins of its corrupt and decaying peoples. But their day as a conquering nation is over, and although the martial spirit is not dead, as witness the gallant defence of the Danes in the late iniquitous contest, their population is diminishing and their language gradually giving way to younger and more vigorous tongues. They have left a strong impress on our country, particularly in the east and north. In some parts of Scotland they arrived before the Celts, and the western isles were a Scandinavian kingdom for many generations, and to this day most of the names are Norse. There were also many Danish Kings of Ireland; while the brilliant episode of the Danish monarchy in England is known to all.

Of the Low Dutch, the oldest is the Gothic. This people penetrating into Europe from the north, either before or about the same time as the Scandinavians, soon became a terror to the continent, which they sacked and conquered from end to end. They established kingdoms in Italy and Spain, and greatly influenced the languages of both countries.

The other Low Dutch dialects were numerous, but the earliest that came into notice were the Jutes, the Saxons, and the Angles. The Jutes occupied Jutland, were probably driven out by incursions of Danes. It is not improbable that they represent the Cimbri, destroyed by Marius, who were Germans, but whose land was called Cimbric from the former Celtic inhabitants. The Jutes occupied the eastern counties of England. The Saxons of the coast were long a trouble to the Roman provinces, from their determined piracies; and in the lower Empire there was a high functionary, called the *Comes littoris Saxonici*, whose duty it was to protect the shore



from the Saxon inroads. These were the people who occupied the southern provinces of Britain, and whose tongue we now talk.

The inland Saxons, still represented in the dialect of modern Saxony, were a different people, once powerful, but crushed by Charlemagne.

The Frisians still occupy part of modern Holland.

The language of the Netherlands remained one until about three centuries ago, when a part having revolted from Spain, two distinct dialects were established, the Dutch and Flemish.

The last important Low Dutch branch is the Angle, which came from the country about the Elbe. They occupied chiefly Scotland, England as far as the Humber and Mersey, and some of the central parts—probably Warwick, &c. The Angle or Northumbrian tongue, was the parent of the Lowland Scotch, and of the provincial dialects of the North of England, while the Saxon as before mentioned, is represented by modern English. It is a strange instance of how names become misapplied in course of time. The Scotch language is the one that ought to be called English or the tongue of the Angles, whilst the English is the tongue of the Saxon, and by that name it is called in all the Celtic languages, *Scotus* on the other hand, which has ceased to be applied to a Celt, meant, in the days of Bede, an Irishman! Many old Scotch writers call the language in which they wrote and spoke *Englis*.

The last and probably latest of the Teutonic group is the High Dutch, the language of Modern Germany. The Germans call themselves *Deutsch*, a word which we have misapplied to the Hollanders. Their language is still very synthetic, and though it has few dialectic varieties of importance, it is gradually pushing the Low Dutch and Scandinavian tongues before it. It was about the time of Luther that the language became definitively fixed in its present form, his translation of the Bible being the first truly German work. Previous to that time they had but one article, but Luther retained it, *der*, as the masculine, and introduced the Low Dutch *die* as the feminine.

It is a matter of some difficulty to assign the proper place to the Franks, who gave their name to France, and considerably modified its language, but I am inclined to think they were a High German people.

And now in this cursory sketch it will be easily understood how much I have been obliged to leave untouched, and how very imperfectly the points dwelt upon have been treated. Nevertheless, from what has been said, it will be evident that as far as language goes, the argument, if insufficient to prove the unity of mankind, is equally imperfect as a proof of its plurality of origin. Viewing mankind then as one race, is it possible that they may ever become of one speech as well as of one blood? Are languages to go on forming, splitting up and dying out, and new ones replacing them to the end of time? Or is it possible that a universal tongue may be established on the



earth? Attempts have been made in this direction and have failed, nor is it possible at present to say how far success is to be expected. At all events it is from the study of the past that we shall find the clue to the reading of the future; and as geology, by discovering the laws which have regulated the changes the earth's surface has undergone, enables us to predict to a certain extent what the future progress of the physical world shall be, so in like manner an enlightened study of ethnology will unquestionably enable us to call up a shadowy outline of the possible future of mankind. It can of course be only as through a glass, darkly, but the view will become clearer as years roll on. For man is regulated by law, as well as the cataclysms of the earth, and the more facts we gather the nearer we shall get to the governing principle, as Tennyson says—

I doubt not through the ages one increasing purpose runs,  
And the thoughts of men are widened with the process of the suns.

It is by such a widening of their thoughts that men may be brought to understand that peace is better than war, and that even as material interest it is better to agree with their brothers while they are in the way. But they will never agree until they know each other better, and become more fully convinced that the noblest study of mankind is man. Then may there be some chance of the vision of the poet being fulfilled—

When the war drum throbs no longer, and the battle flags are furled,  
In the parliament of man, the federation of the world.





A COMPARATIVE VIEW OF A FEW LANGUAGES OF THE ARYAN FAMILY.—See page 10.

### TEUTONIC.

*English*—God has made all mankind of one *blood*.

*Scottish*—God heth made a' mankind o' ane *bluid*.

*Dutch*—God heeft uit eenen *bloede* het gansche geslacht der menschen gemaakt.

*Flemish*—Godt heeft uyt eenen *blædt* het geheel menschelyk geslachte voortgebragt.

*Danish*—Gud haver gjørt al menneskenes sleegt af eet *blod*.

*Swedish*—Gud afwer gjört alt mennisko slaegt af ett *blod*.

*Anglo-Saxon*—God gewörhte of anum *blode* ealle manna dheoda.

*Gothic*—Godh gaskop allos dhindos af ainamma *Blodha*.

*Islandic*—Gud hefur gært af einu *blode* allar dhioder mannanna.

*German*—Gott hat von einem *Blute* aller menschen geschlechter gemacht.

### CELTIC.

*Irish*—Dia do rine 'a uile ceinel daoine d'aon *fuil* amain.

*Scotch Gaelic*—Dia rinn e dhaon *fhuil* uile chinnich dhaoine.

*Welsh*—Duw a wnaeth o un *gwaed* bob cenedl o ddynion.

### ITALIC.

*Latin*—Deus ex uno *sanguine* totas hominum gentes creavit.

*French*—Dieu a créé d'un *sang* tout le genre humain.

*Italian*—Dio ha fatto d'uno *sangue* tutte le gente de g-l'uomini.

### SLAVONIC.

*Bohemian*—Buh utschinil jedne *krwe* wssecko lidske pokoleni.

*Sclavonian*—Bog sotworil she esth o edinije *krowe* wes jesikh-tschlwjetsch.

*Servian*—Opi *krowi* edinoua proesweo Bog saw todh tschelowjetscheskü.

*Bulgarian*—Bog sosdal eo edna *kruw* snschkia rod tschelowjetscheskü.

*Wendish*—Boh je tchinil sowot jenehe *kruje* shitkish tchlowkow narod.

*Polish*—Bog utschynil s iedney *krwi* uschystek rodsay ludski.

*Russian*—Bog opi odnoi *krowi* proeswel wsjach tscherowjakow.



NOTE.—The Tongues printed in *Italics* are extinct, and without direct descendants.

TABLE I.

## ARCHAIC.

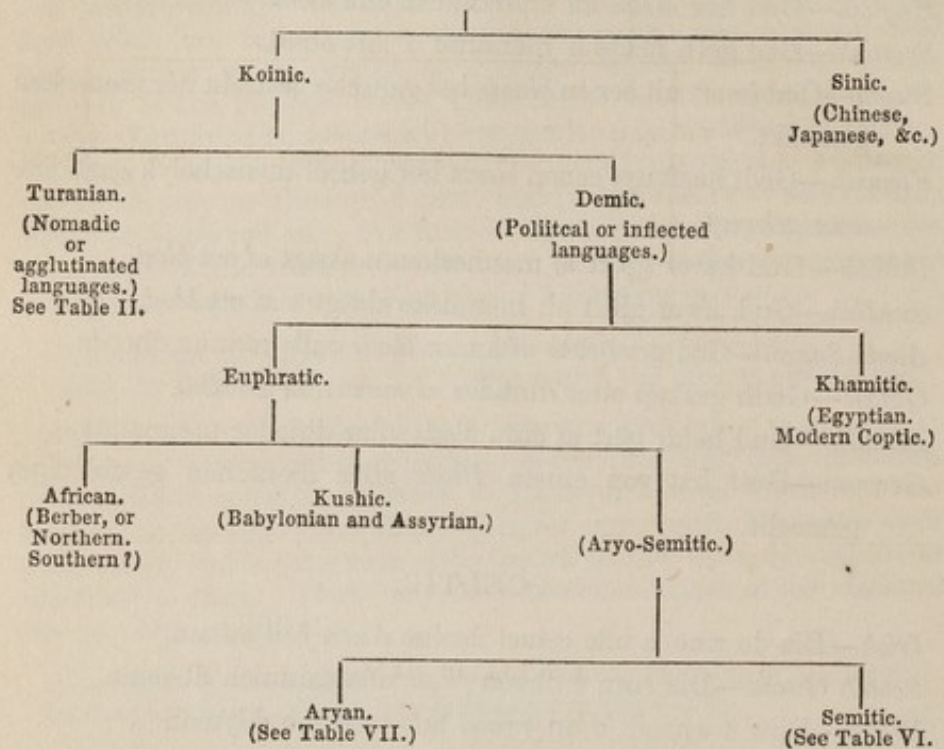


TABLE II

## TURANIAN.

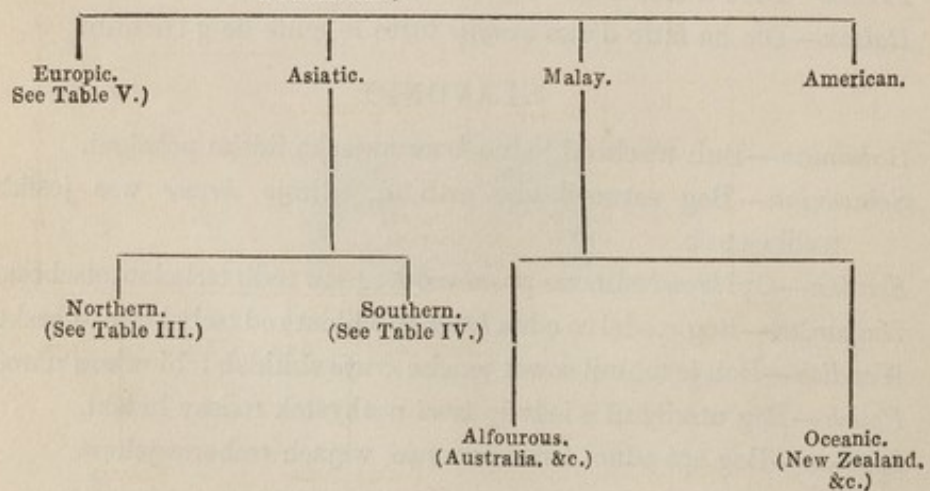




TABLE III.

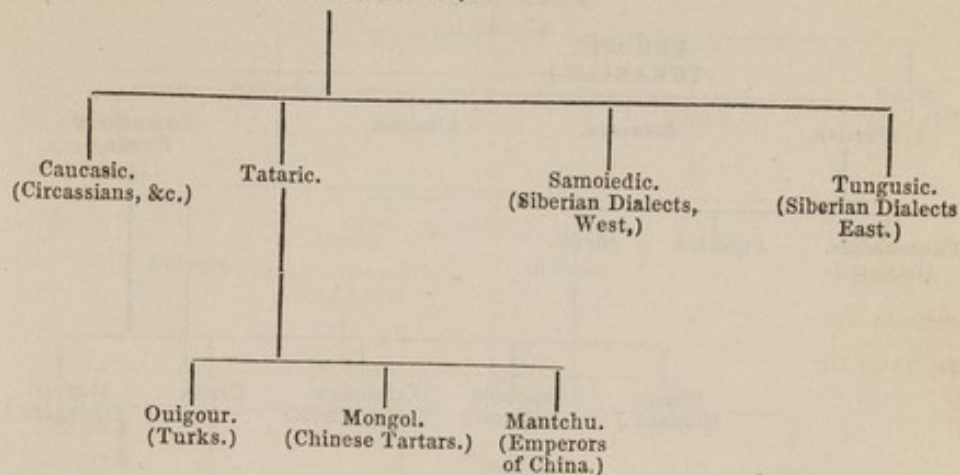
ASIATIC.  
(NORTH TURANIAN.)

TABLE IV.

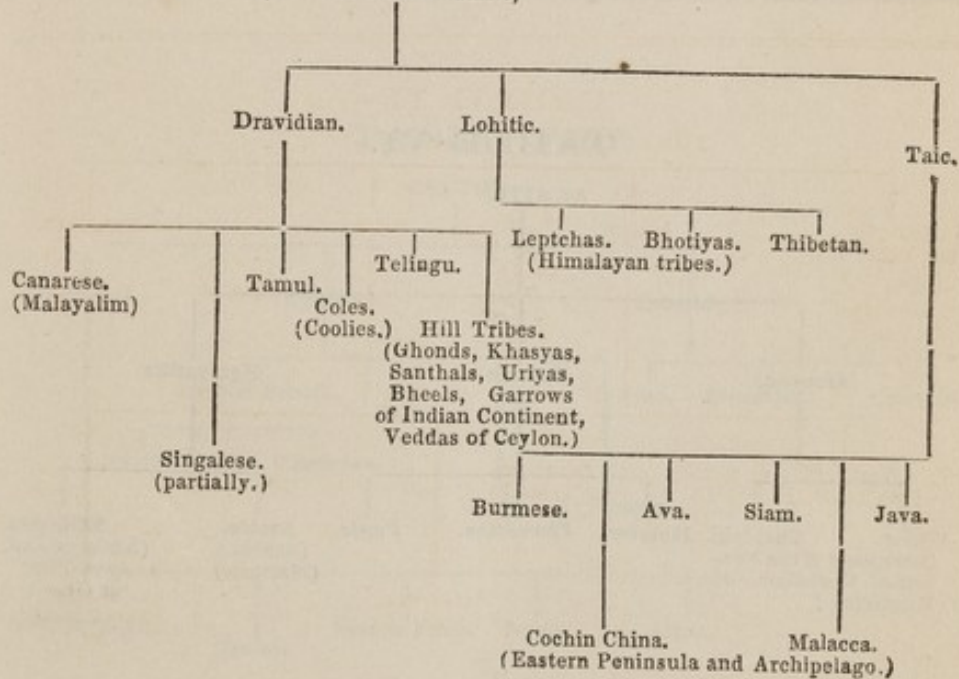
ASIATIC.  
(SOUTH TURANIAN.)



TABLE V.

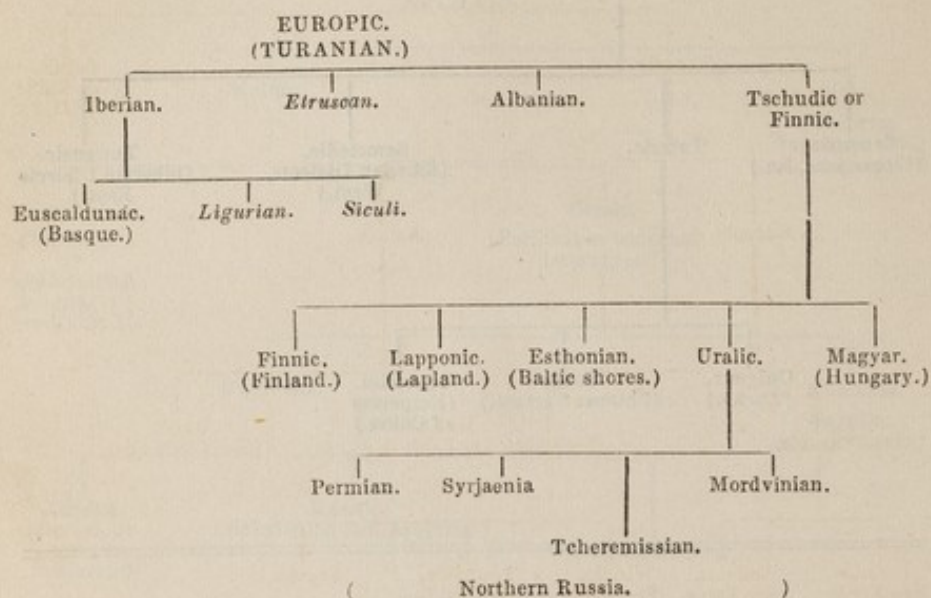


TABLE VI.

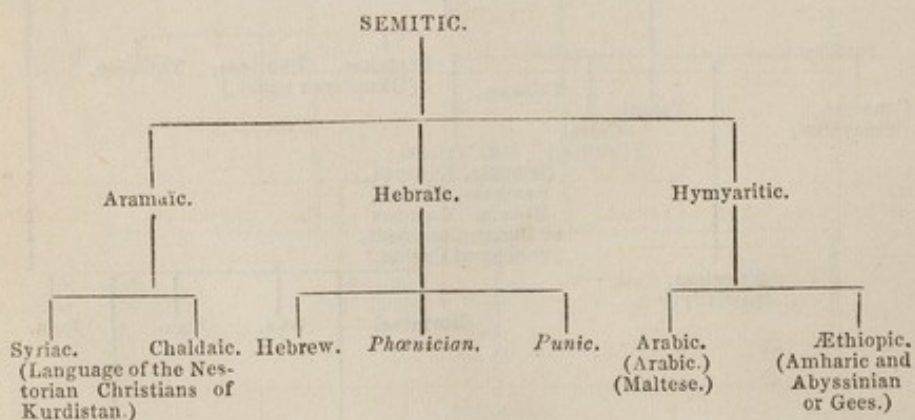




TABLE VII.

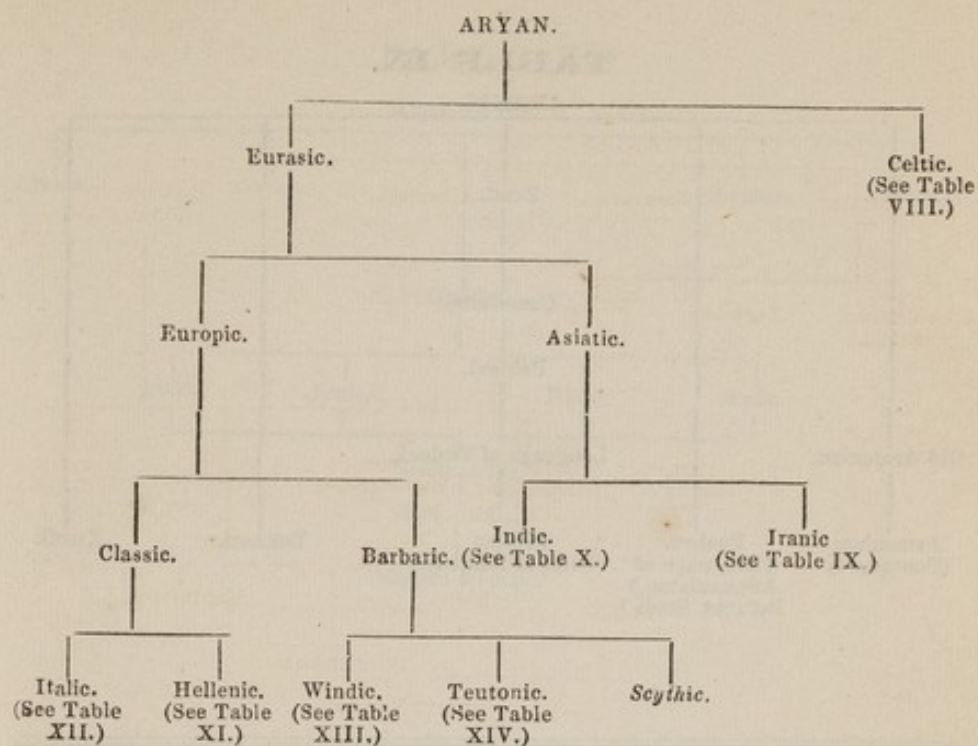


TABLE VIII.

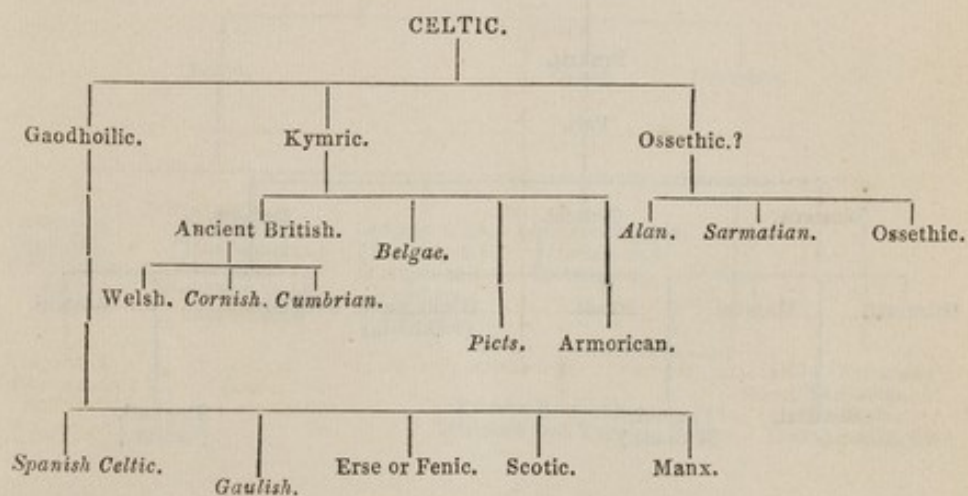




TABLE IX.

## IRANIC.

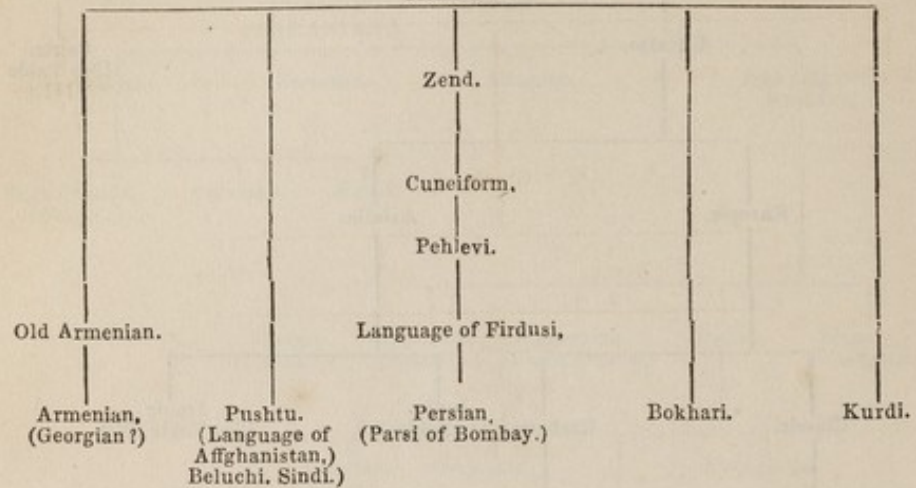


TABLE X.

## INDIC.

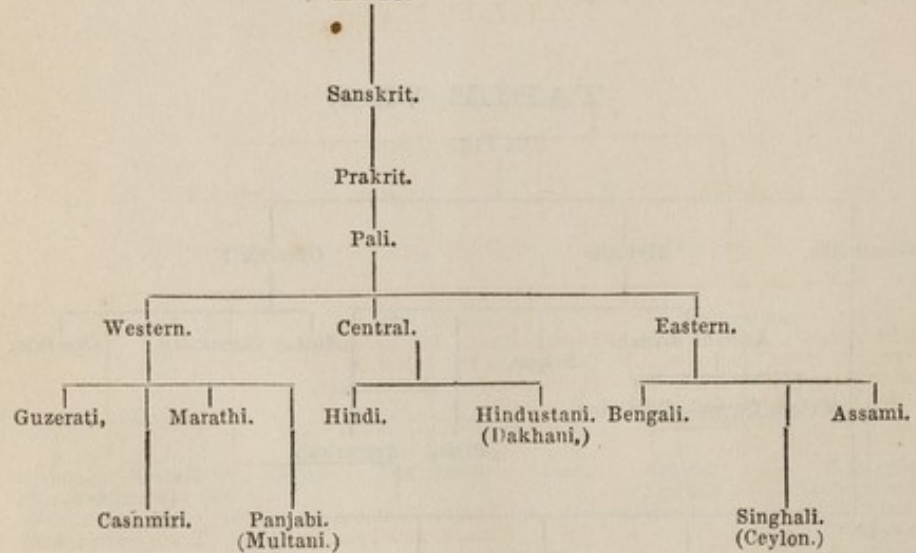




TABLE XI.

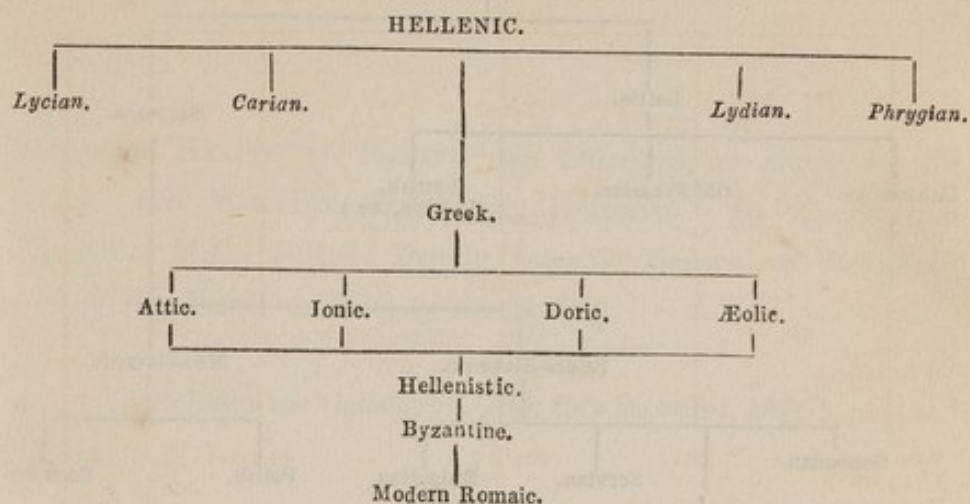


TABLE XII.

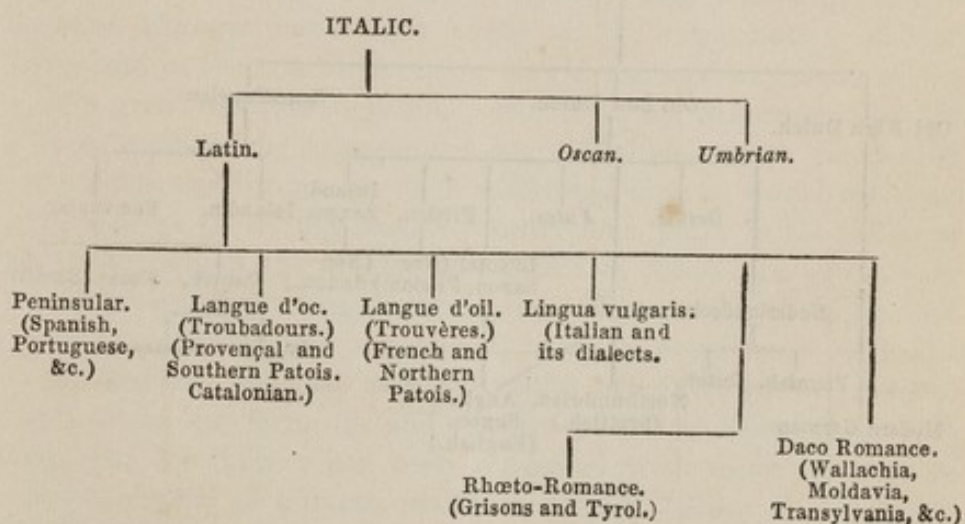




TABLE XIII.

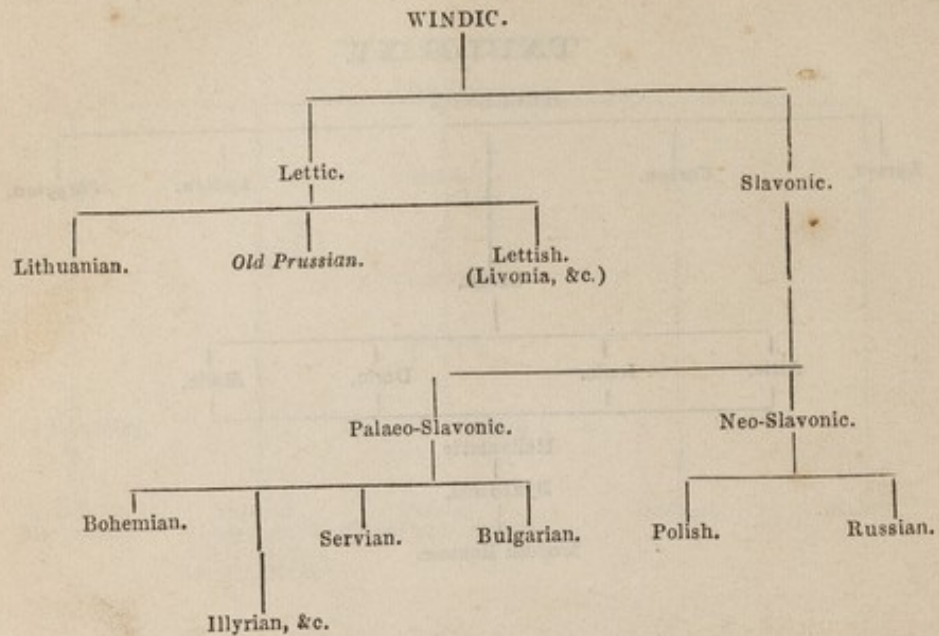
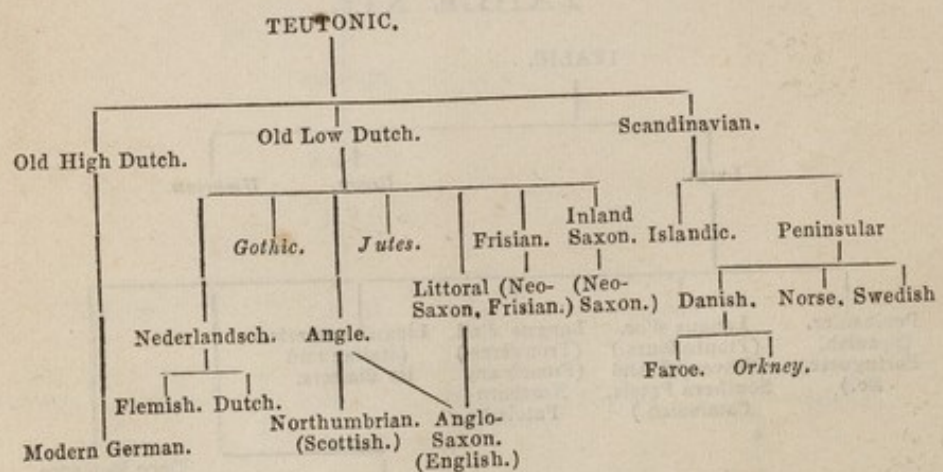


TABLE XIV.





COMPARATIVE HEALTH of SEAMEN and SOLDIERS, as shown by the  
NAVAL and MILITARY STATISTICAL REPORTS. By T. GRAHAM  
BALFOUR, M.D., F.R.S., *Deputy Inspector-General of Hospitals,*  
*one of the Vice-Presidents of the Society.*

[Read before the Statistical Society, 19th December, 1871.]

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I.—*Introduction.*

UPWARDS of thirty years have elapsed since a paper on the comparative sickness, mortality, and prevailing diseases among seamen and soldiers serving in the Mediterranean was read to this Society by the late Sir A. M. Tulloch.\* During that period great and important changes have been made in the organisation of both services and in the conditions upon which the sanitary state of the men in a great measure depends. In the army, enlistment for life has been replaced by engagement for a limited period, renewable, under certain conditions, for such additional time as would make up a total service of twenty-one or twenty-four years in the different arms; after which the soldier is entitled to retire on a pension for life. The barrack accommodation has been improved by apportioning the space, cubic and superficial, more in accordance with the laws of sanitary science, and by careful attention to ventilation; alterations in the form, fit, and texture of the clothing have been introduced; the dietary has been regulated with more attention to the requirements of climate, and with greater variety in the means of cooking; the opportunity of obtaining wholesome food and drink, without being exposed to the temptations of the beer shop and public house, has been afforded to the soldier by the establishment of regimental canteens, and increased facilities for ablution have

\* *Journal of the Statistical Society*, vol. iv, p. 1.



been provided. The education of the soldier has not been neglected, every facility being now afforded him of obtaining instruction under experienced trained schoolmasters, and the opportunity of physical recreation being provided by means of gymnasia, ball courts, cricket grounds, &c. Libraries and reading rooms furnish him with occupation for his leisure time, and to some extent provision has been made to enable him to acquire a trade or to turn to account one acquired previously to enlistment. In addition to these advantages he has received an increase to his pay, which, however, there is too good reason to fear is not always expended in a manner conducive to health.

During the same period changes of equal importance have been made in the condition of the seamen in the royal navy. Formerly, when ships were put into commission at the different ports, their crews were gradually completed in a very slow manner by volunteers, many of whom were merchant seamen, and not a few landmen; they were engaged only for the time the vessel remained in commission, usually from three to four years, when they were paid off and received the great bulk of their pay on discharge. Leave of absence was seldom granted to seamen serving abroad, and when granted it was the custom to allow a very large number to go ashore usually for two days at a time; the result was, that during these short periods of leave, and still more when paid off on returning to England with considerable sums in their possession, the men indulged in every kind of excess, to the serious deterioration of their constitutions. Now, seamen are enlisted for a period of ten years' continuous service; they are recruited almost entirely from boys, carefully selected and subsequently trained for thirteen months in special training ships at the home ports, from which they are drafted at the average age of  $15\frac{1}{2}$  or 16, and are bound to serve ten years continuously after they have been rated seamen; ships are thus provided with complete crews of trained seamen and boys immediately they are placed in commission. At the termination of a ship's commission, leave of absence, proportionate to the time served in the ship, is granted to the seamen, with full pay, at the expiration of which they join the depôts, where they remain till required for further service. Wages are now paid monthly, and leave of absence is constantly granted to men of good character. The seamen enjoy themselves on shore in a rational manner, and return to their ships at the expiration of their leave. As a result of these improvements, drunkenness, formerly the besetting sin of seamen on shore, has been greatly reduced, and the man-of-war's-man of the present day is, as a general rule, sober, steady, and well-conducted; and, from the system of recruiting and training boys, education and intelligence are steadily increasing in the service.



The increased size of the modern ships affords considerably more cubic space per man; the additional height between decks enables the hammocks to be suspended at a greater distance than formerly from the deck to which they are swung, removing the men to some extent from the heated and vitiated air resulting from so large a number of men sleeping in close proximity; great attention is paid to ventilation, and abundant facilities for ablution by means of washing places and baths, are now provided.

It may be interesting to the Society to have the important question of the health of our sailors and soldiers again brought under its consideration, and especially with a view to examine what has been the practical result of these important changes, and whether they have proved equally advantageous in the two services. The means of making this inquiry are furnished by the annual reports on the health of the navy and army which have for some years been presented to Parliament. It will be convenient to confine it to the ten years from 1859 to 1868 inclusive, the date of the last volume published on the health of the navy. Unfortunately different classifications of diseases were in use in the two services during that period, and there has consequently been some difficulty experienced and a considerable amount of labour involved in preparing the necessary tables of diseases.\* This has been done with as much care as possible, and although perhaps in some of the minor details not strictly accurate, they approximate sufficiently to justify a comparison of the results. The classification in use in the army has been adopted, but with some modifications which were deemed necessary to bring the diseases of the two services into more accurate comparison.

In the paper by Sir A. M. Tulloch it was found necessary to confine the inquiry to the naval and military forces serving in the Mediterranean, but as the late volumes furnish the requisite information respecting the navy on the Home Station, it may be interesting first to compare the sickness and mortality in it with those of the infantry regiments serving in the United Kingdom, and then to extend the inquiry to the Mediterranean Command.

## II.—*Home Station.*

The average annual strength of the naval force employed on the Home Station during the ten years 1859-68, did not differ materially from that of the infantry regiments serving in the United Kingdom during the same period, the former having been 21,464, and the

\* Since this was written, the "Statistical Report on the Health of the Navy for 1869" has been published. It is a great satisfaction to be able to state that the difficulty arising from the use of different classifications no longer exists, both services having adopted in their Reports for 1869 the nomenclature and classification prepared by the Royal College of Physicians.



latter 23,386. Table A (Appendix), p. 21, shows the sickness, mortality, invaliding, and mean daily sick in each year of the decade, and the average of the whole period for each of the services.

This table shows the sickness in the navy, as measured by the admissions into hospital, to have been one-fifth, and by the proportion constantly sick 1·20 per 1,000 of the strength higher than in the army, and the deaths from all causes to have been ·48 per 1,000 higher, but the invaliding to have been about 1 per 1,000 lower.

In the paper already referred to, it was shown that the sailors are much more exposed by the nature of their duties to accidental injuries and to deaths from violence, frequently involving, as in the loss of a ship, or the upsetting of a boat, considerable numbers of men. It becomes necessary, therefore, to deduct all cases of this kind from the returns of both services before bringing into comparison the relative health of the men. This has accordingly been done in the following table:—

|   | Naval Force.            |       |                         | Infantry Regiments.     |       |                         |
|---|-------------------------|-------|-------------------------|-------------------------|-------|-------------------------|
|   | 214,640                 |       |                         | 233,858                 |       |                         |
| Aggregate strength .....                            | Admitted into Hospital. | Died. | Discharged as Invalids. | Admitted into Hospital. | Died. | Discharged as Invalids. |
| Total, as in Table A.....                           | 222,541                 | 1,810 | 5,855                   | 194,048                 | 1,860 | 6,106                   |
| Deduct those from }<br>wounds and injuries.... }    | 39,759                  | 447   | 442                     | 16,057                  | 212   | 215                     |
| Total from diseases ....                            | 182,782                 | 1,363 | 5,413                   | 177,991                 | 1,648 | 5,891                   |
| Annual ratio per 1,000 }<br>of mean strength..... } | 852·                    | 6·35  | 25·22                   | 761·                    | 7·05  | 27·50                   |

From this it appears that the admissions into hospital for diseases, exclusive of accidents and injuries, have been one-ninth higher among the sailors, but that the deaths have been ·70, and the invaliding on account of disease, 2·28 per 1,000 of the strength higher among the soldiers. The difference in the rate of mortality may probably be to a great extent accounted for by the difference of age in the two services, the proportion of boys—at that age when mortality is at its minimum,—being 10 per cent. of the force in the navy, and a little above 3 per cent. in the infantry.

There are no means of making a perfectly accurate comparison of these results with those of a former period, as at that time ships on the Home Station were grouped into two classes, the "Home" and the "Various," the results of the former being rather more



favourable than of the latter, while the only data relating to troops of the line at home for that period refer to the cavalry, among whom the admissions and deaths are generally lower than in the infantry. But a comparison of the preceding results, even with these more favoured bodies of men, shows a very satisfactory reduction in both sickness and mortality.

|                  | Naval Force.  |       | Military Force.            |       |
|------------------|---|-------|----------------------------|-------|
|                  | Exclusive of Wounds and Injuries.<br>Ratio per 1,000 of Mean Strength |       |                            |       |
|                  | Admitted<br>into Hospital.  | Died. | Admitted<br>into Hospital. | Died. |
| 1830-36* .....   | 983   | 8.8   | 803                        | 13.7  |
| '59-68 .....     | 852   | 6.35  | 761                        | 7.05  |
| Difference ..... | 131   | 2.45  | 42                         | 6.65  |

\* See "British and Foreign Medical Quarterly Review" for April, 1844, p. 313.

This table shows a marked reduction in the admissions and deaths in the naval force, and a smaller reduction in the admissions, but much larger one in the deaths in the army. Indeed the mortality in the latter has been little more, and, if the comparison could have been made with infantry instead of cavalry for the first period, it would probably have been less than half the previous ratio. It will be observed, that while the mortality in the army was one-half higher than in the navy during the seven years 1830-36, it was very little above it during the last ten years; not more, indeed, than might be accounted for by the difference of age in the two services.

The influence of the different classes of diseases in causing sickness and mortality in the navy and army respectively, is shown in the Appendix, Table B, p. 22.

MIASMATIC DISEASES were more prevalent and more fatal in the navy than in the army, but the invaliding was slightly higher in the latter. As this class, however, includes many maladies differing greatly from each other, the following table of the principal diseases comprised in it is submitted, with a view to trace more closely the affections in which the difference is most manifest.



| Aggregate strength .....                  | Naval Force. |       |                  |       | Infantry Regiments. |       |                  |       |
|---|--------------|-------|------------------|-------|---------------------|-------|------------------|-------|
|   | 214,640.     |       |                  |       | 233,858.            |       |                  |       |
|   | Admitted.    | Died. | Ratio per 1,000. |       | Admitted.           | Died. | Ratio per 1,000. |       |
|   |              |       | Admitted.        | Died. |                     |       | Admitted.        | Died. |
| Eruptive fevers .....                     | 1,593        | 50    | 7.4              | .23   | 635                 | 21    | 3.7              | .09   |
| Intermittent fever .....                  | 1,677        | 2     | 7.8              | .01   | 1,229               | 4     | 5.2              | .02   |
| Remittent and con-<br>tinued fevers ..... | 2,970        | 119   | 13.8             | .55   | 4,481               | 118   | 19.2             | .50   |
| Dysentery and diarrhœa .....              | 7,463        | 17    | 34.8             | .08   | 2,995               | 14    | 12.8             | .06   |
| Cholera .....                             | 37           | 9     | 0.2              | .04   | 9                   | 7     | 0.4              | .03   |
| Sore throat .....                         | 9,436        | 6     | 44.0             | .03   | 5,932               | 4     | 25.4             | .02   |
| Ophthalmia .....                          | 2,604        | —     | 12.1             | —     | 5,478               | —     | 23.4             | —     |
| Erysipelas .....                          | 702          | 18    | 3.3              | .08   | 453                 | 20    | 1.9              | .08   |
| Rheumatism .....                          | 13,278       | 8     | 61.9             | .04   | 5,300               | 8     | 22.7             | .03   |

*Eruptive fevers* were twice as prevalent in the naval force as in the infantry, a difference probably due to the much larger proportion in the former of boys at that period of life when eruptive fevers are more common, and to the difficulty of enforcing on board ship that separation of the cases from the healthy which is so essential to prevent the spread of these affections. Measles were very rife in the naval force in 1860 and 1867; scarlet fever in 1861 and 1863, and also, though to a less extent, in 1866, and small pox in 1864 and in 1860. In the latter year the disease was of a very fatal character, the deaths having been 1 in 7 cases, or 14.3 per cent.; in 1864 they were in the proportion of only 1 in 22, or about  $4\frac{1}{2}$  per cent.

*Intermittent fever* was slightly more prevalent in the navy, but in neither service was it a source of much inefficiency.

*Remittent and continued fevers* were nearly one-half more prevalent in the infantry than among the seamen, but the excess was probably in slight cases of fever, as the mortality in the two services was identical.

*Dysentery and diarrhœa* were nearly thrice as prevalent in the navy as the army, a result probably of the difference in the diet, and perhaps also of the greater exposure of the sailors to wet and cold, but the difference in the mortality was very slight.

*Sore throat and rheumatism* were much more prevalent in the navy, particularly the latter, the admissions by which were nearly thrice as high as in the army. The difference was probably the result of the relative exposure of the men when on duty to wet and cold, and to the damp atmosphere by which they are continually surrounded. *Erysipelas* was also more prevalent, but not more



fatal than in the army; the excess may probably be due to the difficulty of obtaining adequate ventilation on board ship. In *ophthalmia* the sailors enjoy an exemption, the admissions having amounted to only one-half the proportion among the soldiers.

VENEREAL DISEASES.—Owing to the grouping of diseases adopted in the naval report, it has been found necessary to restrict the diseases classed under this head to syphilis, primary and secondary, gonorrhœa, and stricture of the urethra. The relative prevalence of these in the two services has been as follows:—

|                      | Naval Force. |       |                  |       | Infantry Regiments. |       |                  |       |
|----------------------|--------------|-------|------------------|-------|---------------------|-------|------------------|-------|
|                      | Admitted.    | Died. | Ratio per 1,000. |       | Admitted.           | Died. | Ratio per 1,000. |       |
|                      |              |       | Admitted.        | Died. |                     |       | Admitted.        | Died. |
| Syphilis .....       | 16,920       | 3     | 78·8             | ·01   | 30,594              | 17    | 130·8            | ·07   |
| Gonorrhœa .....      | 6,048        | —     | 28·2             | —     | 25,635              | —     | 109·6            | —     |
| Stricture of urethra | 717          | 6     | 3·4              | ·03   | 578                 | 4     | 2·5              | ·02   |

This table shows a much lower ratio of admissions into hospital from syphilis and gonorrhœa among the sailors than the soldiers, probably because they have fewer opportunities of contracting them, and also because slight cases of gonorrhœa are, it is understood, treated on board ship without the men being taken off duty. The latter view seems to be supported by the circumstance that in the navy the cases of gonorrhœa are in the proportion of 1 to  $2\frac{3}{4}$  of syphilis, while in the army they are in the proportion of 5 to 6, and also by the proportion of cases of stricture being somewhat higher in the navy. This comparative exemption of the sailor from syphilis and gonorrhœa was found to exist during the period comprised in the earlier reports, 1830-36, when the admissions by all venereal diseases in the two services respectively, were 133 and 181 per 1,000 of the strength.

PARASITIC and DIATHETIC DISEASES seem to require little remark, the difference of their prevalence in the two services being very trifling. It may be noticed, however, that in the naval service a number of cases of gout appear in the returns, and scarcely any in the army, a difference arising from the diseases of the officers being included with those of the men in the former and not in the latter.

TUBERCULAR DISEASES.—From this important and very fatal class of diseases, the navy enjoys a marked exemption over the army. Dividing the diseases into two groups, the results in each service have been as follows:—



|                                 | Naval Force. |       |                  |       | Infantry Regiments. |       |                  |       |
|---------------------------------|--------------|-------|------------------|-------|---------------------|-------|------------------|-------|
|                                 | Admitted.    | Died. | Ratio per 1,000. |       | Admitted.           | Died. | Ratio per 1,000. |       |
|                                 |              |       | Admitted.        | Died. |                     |       | Admitted.        | Died. |
| Scrofula .....                  | 270          | 1     | 1·2              | 1·98  | 804                 | 8     | 3·4              | ·03   |
| Phthisis and hæmoptysis } ..... | 1,579        | 423   | 7·3              |       | 2,648               | 550   | 11·3             | 2·35  |

The admissions by consumption have been 4 and the deaths ·40 per 1,000 of the strength lower in the navy than the army, and this reduced mortality has not been the result of an excess of invaliding in the former, the proportion discharged for tubercular diseases having been 1 per 1,000 lower than in the army. It may, therefore, be fairly inferred that there is something in the condition of the sailor which renders him less amenable than the soldier to these diseases. It has already been shown that he suffers much less from syphilis; it may be a question how far the excess of that disease in the army may account for the difference. No one who has seen much of syphilis can doubt that it is a very powerful agent in the development of other constitutional diseases, and among these especially of pulmonary consumption. The beneficial influence of a sea voyage in persons predisposed to phthisis is also an acknowledged fact, and the condition of service in the navy may therefore be an important agent in the prevention of these diseases among the sailors.

DISEASES OF THE NERVOUS SYSTEM.—In this class the admissions, deaths and invaliding have been lower in the army than the navy, but the deaths have been almost identical in the two services. The excess of admissions is partly due to a number of cases in the navy having been returned under the term headache; but it is also seen in some more important diseases. Thus, in *delirium tremens* and *epilepsy*, the admissions in the navy are nearly double those in the army, as will be seen by the following table:—

|                       | Naval Force. |       |                  |       | Infantry Regiments. |       |                  |       |
|-----------------------|--------------|-------|------------------|-------|---------------------|-------|------------------|-------|
|                       | Admitted.    | Died. | Ratio per 1,000. |       | Admitted.           | Died. | Ratio per 1,000. |       |
|                       |              |       | Admitted.        | Died. |                     |       | Admitted.        | Died. |
| Delirium tremens .... | 630          | 19    | 2·9              | ·09   | 267                 | 19    | 1·1              | ·08   |
| Epilepsy .....        | 800          | 12    | 3·7              | ·06   | 636                 | 8     | 2·7              | 0·3   |



From this it would appear that *delirium tremens* is more than twice as prevalent in the navy as in the army; but this may perhaps to some extent be accounted for by a proportion of cases bordering on that disease having been reported under the head of *intemperance* in the army, while this distinction was not recognised in the navy—a supposition which is confirmed by the rate of mortality having been almost identical in the two services. The cases of epilepsy were one-fourth more numerous in the navy, and the mortality, though very low, was double that of the army from that disease.

DISEASES OF THE CIRCULATORY SYSTEM caused very nearly the same proportion of admissions and deaths in the two services, but the invaliding from them was a fourth higher in the army. It may be a question how far this excess has been due to the equipment, clothing, and drill of the soldier.

DISEASES OF THE RESPIRATORY SYSTEM were much more prevalent but were less fatal in the navy than in the army. The excess of admissions was chiefly in cases of bronchitis, of which there were 135 per 1,000 of the strength in the navy, and only 81 per 1,000 in the army. Pneumonia and pleurisy were likewise more prevalent in the navy, the proportion of cases in it being 18.0 and in the army 8.8 per 1,000. It is probable that the difference in these diseases may be due to the greater exposure of the sailors to wet and cold. The deaths by pneumonia and pleurisy were .89 in the navy and .73 per 1,000 in the army.

DISEASES OF THE DIGESTIVE SYSTEM were upwards of one-half more prevalent in the navy than in the army, but with a slightly lower rate of mortality. The disease in which the great excess of cases occurred was dyspepsia, by which there were 37.4 admissions per 1,000 in the navy and 13 in the army. There was also a much higher ratio of cases of colic, the admissions being 10 per 1,000 in the former and 3 in the latter. It seems very probable that the difference in these diseases was the result of diet. In hernia, also, there was an excess in the navy, the proportion in the two services being 2.62 and 1.76 per 1,000. The greater amount of muscular exertion involved in the discharge of the sailor's duties may account for this difference.

The manner in which the naval returns have been framed does not allow of an accurate comparison of some of the other classes of diseases, particularly those of the integumentary system; but among the more prevalent affections of that class, boils, abscesses, and ulcers may be brought into comparison, and their relative prevalence has been as follows:—



|                          | Naval Force. |                           | Infantry Regiments. |                           |
|--------------------------|--------------|---------------------------|---------------------|---------------------------|
|                          | Admitted.    | Ratio per 1,000 Admitted. | Admitted.           | Ratio per 1,000 Admitted. |
| Boils and abscesses .... | 32,715       | 152.4                     | 15,485              | 66.2                      |
| Ulcers .....             | 14,612       | 68.1                      | 7,311               | 31.3                      |

Thus it appears that these affections have caused more than double the proportion of admissions in the navy. The excess may probably be, to a great extent, due to three causes—the diet of the sailors, their constant exposure to the stimulating effects of the salt water upon their feet and legs, and the injuries which they receive in handling the ropes, climbing the rigging, &c.

ACCIDENTS AND VIOLENCE.—It has been already stated that the mortality under this head in the navy greatly exceeded that of the soldiers. In the former it amounted to 2.08, and among the latter to .90 per 1,000 of mean strength annually. The total deaths by this class in the naval force in the ten years were 447; of these 275 were by drowning, of which 13 were returned as suicidal; 84 were by falls from aloft, and 18 by objects falling upon the men, leaving only 70, or .30 per 1,000 from other causes of this class. It must be obvious that any comparison between the two services from which these deaths were not eliminated must unavoidably have led to erroneous deductions.

### III.—*Mediterranean Station.*

The average strength of the naval force employed on the Mediterranean station during the ten years 1859-68, was 8,991, and that of the troops at Gibraltar and Malta was 10,681. Table C (Appendix), p. 23, shows the sickness, mortality, and invaliding, and the number constantly non-effective from sickness in the two services in each year of that period.

This table shows the admissions into hospital and the mean daily sick to have been much higher in the naval than the military force; the mortality, however, was 2.33 per 1,000 of the strength higher in the latter, but the invaliding amounted only to half that in the navy. The excess in the admissions and mean sick was apparent in every year of the decade, but that of the deaths among the military was confined to certain years, principally 1865, 1867, and 1868, the ratio in some of the other years having been lower than in the navy.

On deducting the admissions and deaths by accidents and



violence, for the reasons already stated, the following results are obtained:—

| Aggregate strength .....                       | Naval Force.            |       |                        | Military.               |        |                        |
|--|-------------------------|-------|------------------------|-------------------------|--------|------------------------|
|  | 89,910.                 |       |                        | 106,813.                |        |                        |
|  | Admitted into Hospital. | Died. | Sent Home as Invalids. | Admitted into Hospital. | Died.  | Sent Home as Invalids. |
| Total, as in Table C.....                      | 133,572                 | 851   | 3,889                  | 89,484                  | 1,259  | 2,342                  |
| Deduct those from accidents and violence ....  | 24,887                  | 223   | 230                    | 8,658                   | 145    | 61                     |
| Total from diseases ....                       | 108,685                 | 628   | 3,659                  | 80,826                  | 1,114  | 2,281                  |
| Ratio per 1,000 of mean strength, 1859-68..... | 1,212                   | 6.98  | 40.70                  | 757                     | 10.43  | 21.35                  |
| Ditto, 1830-36 .....                           | 1,082                   | 9.26  | —                      | 989*                    | 18.63* | —                      |

\* As the results for the military force during the later period are founded on the Returns from Gibraltar and Malta only, while those from the Ionian Islands also were included in Sir A. Tulloch's paper, it has been deemed necessary, for the greater accuracy of comparison, to re-calculate the ratios for the period 1830-36, in this table, excluding the Ionian Islands. These ratios, therefore, though not differing materially from, are not identical with, those stated in the previous paper.

The admissions by diseases have been one-half higher in the navy than in the army, and the proportion of men invalided has been nearly double, but the mortality has been 3.45 per 1,000 lower than that of the army. Compared with the results of the seven years 1830-36, the admissions into hospital in the navy have been one-ninth higher, while in the army they have been one-fourth lower than the average of that period. The mortality in the navy has fallen by 2.18 per 1,000 of the strength, but in the army the decrease has been 7.50, or upwards of two-fifths of the previous average.

The influence of the principal classes of diseases in causing the sickness, mortality, and invaliding in the two services is shown in the Appendix, Table D, p. 24.

MIASMATIC DISEASES have been only slightly more prevalent but much more fatal in the army than the navy; but in the latter there has been an excess in the proportion invalided to England. The following table shows the relative prevalence and mortality of the principal diseases of this class in the two services:—



| Aggregate strength ....                   | Naval Force. |       |                  |       | Military. |       |                  |       |
|---|--------------|-------|------------------|-------|-----------|-------|------------------|-------|
|   | 89,910.      |       |                  |       | 106,813.  |       |                  |       |
|   | Admitted.    | Died. | Ratio per 1,000. |       | Admitted. | Died. | Ratio per 1,000. |       |
|   |              |       | Admitted.        | Died. |           |       | Admitted.        | Died. |
| Eruptive fevers .....                     | 466          | 27    | 5.2              | 0.30  | 144       | 8     | 1.3              | 0.07  |
| Intermittent fever .....                  | 1,459        | —     | 16.2             | —     | 241       | 3     | 2.3              | 0.03  |
| Remittent and con-<br>tinued fevers ..... | 5,768        | 146   | 64.1             | 1.62  | 14,703    | 320   | 137.6            | 2.99  |
| Dysentery and diarrhoea .....             | 9,806        | 23    | 109.1            | 0.26  | 6,498     | 83    | 60.8             | 0.78  |
| Cholera .....                             | 22           | 9     | 0.2              | 0.10  | 316       | 216   | 2.9              | 2.02  |
| Sore throat .....                         | 4,305        | 2     | 47.9             | 0.02  | 1,610     | —     | 15.1             | —     |
| Ophthalmia .....                          | 996          | —     | 11.1             | —     | 5,763     | —     | 54.0             | —     |
| Erysipelas .....                          | 379          | 12    | 4.2              | 0.13  | 108       | 4     | 1.0              | 0.04  |
| Rheumatism .....                          | 8,215        | 7     | 91.4             | 0.08  | 4,598     | 3     | 43.0             | 0.03  |

*Eruptive fevers* were four times as prevalent and fatal in the navy as in the army, chiefly from the occurrence of small pox in 1860, 1861, 1862, and 1868, and also, though to a much less extent, from measles in 1864, and scarlet fever in 1863 and 1864. In 1860 small pox broke out in the "Agamemnon," at Gibraltar, when 22 cases and 1 death occurred, and 3 cases subsequently when the ship was at Palermo. The "Amphion" had 14 cases and 2 deaths at Palermo, and the "Renown" 29 cases, all of which recovered. In the same year, 81 cases and 5 deaths occurred on board the "Hannibal" at Naples. In 1862 the "Doris," at Beyrout, had 58 cases and 3 deaths, the disease showing itself first in January; the "Racoon," at the same place, had 7 cases with 1 death, and the "Liffey," 13 cases, none of which proved fatal. The "Cressy," at Naples, had 3 cases with 2 deaths, and the "Agamemnon," at Malta, had 6 cases in December. In these two years there were 258 cases and 17 deaths by this disease. At that period revaccination was not the rule in the navy, and was only done when the marks of vaccination were not satisfactory. It has since been adopted as a general rule, as in the army, that all men and boys entering the service shall be revaccinated; and it may be fairly hoped that the results of the next ten years will afford evidence of the wisdom of this regulation. In 1868 there were 12 cases in the "Arethusa" at Malta, but the disease had been contracted at the Piræus, and 11 cases, 1 of which proved fatal, in the "Lord Warden," also contracted there. The history of these outbreaks of small pox shows one of the risks to which sailors are exposed more than the soldiers, that of contracting diseases which may be prevalent among the civil population of the ports at which they call, or in the vicinity of which they may be cruising.



INTERMITTENT FEVER was more prevalent in the navy than the army, the sailors being more exposed to malaria in cruising about the shores of the Mediterranean than the soldiers quartered in Gibraltar and Malta. During the period 1830-36, the proportion of cases of intermittent was very much higher in both services, but particularly in the army.

REMITTENT AND CONTINUED FEVERS were more than twice as prevalent and nearly twice as fatal in the army as in the navy. This was chiefly due to the great prevalence of fever at Malta in several years of the decade, particularly in 1859, 1860, 1867, and 1868, when the ratio of admissions ranged from 206 to 229, and of deaths from 3·86 to 8·85 per 1,000 of the strength. The disease was of local origin, depending in a great measure on defective sewerage, especially at St. Elmo, insufficient ventilation, and overcrowding of the barracks.

Compared with the results for the seven years 1830-36, there has been a slight reduction in the ratio of admissions, but a slight increase in the deaths, by these fevers, as will be seen by the following table :—

*Remittent and Continued Fevers.*

|                   | Ratio per 1,000 of Mean Strength. |       |           |       |
|-------------------|-----------------------------------|-------|-----------|-------|
|                   | 1830-36.                          |       | 1859-68.  |       |
|                   | Admitted.                         | Died. | Admitted. | Died. |
| Naval force ..... | 77·9                              | 1·40  | 64·1      | 1·62  |
| Military „ .....  | 161·6                             | 2·53  | 137·6     | 2·99  |

*Dysentery and Diarrhœa* were much more prevalent among the sailors than the soldiers, a result probably of their diet and also of their greater exposure to malaria; but the mortality in the army was thrice as high as in the navy. Compared with the previous period there has been an increase in their prevalence in the navy, but a decrease to the extent of one-half in the army—the reduction in the latter probably due to improved diet. In both services, but especially in the army, there has been a marked reduction in the mortality.

*Cholera* prevailed as an epidemic twice at Gibraltar and twice at Malta during the ten years. The first epidemic at Gibraltar was in 1860, from August till December, when, in a strength of 5,609, there were 50 cases and 31 deaths among the troops. It broke out in Malta in June, 1865, when there were 117 cases and 86 deaths in



a strength of 5,523; and in the same year it prevailed at Gibraltar from August till October, causing 121 admissions and 76 deaths in a force of 4,803 men. It appeared again in Malta in July, 1867, when 27 cases and 22 deaths occurred in a strength of 4,919 men. On all these occasions, except 1865, the navy escaped the disease, and in that year it had only 10 cases and 7 deaths in a force of 7,240 men; 4 cases and 3 deaths occurred in one of the ships at the mouth of the Danube, where the disease was then prevalent among the population, 2 cases occurred at Alexandria, and 3 fatal cases at Malta. The navy enjoys the great advantage over the army of being able, when this disease breaks out as an epidemic in any locality, to withdraw from the infected place. This was done on both occasions when it appeared in Malta, as many of the ships as could be spared having gone on a cruise and not having returned till the epidemic was at an end.

As in the Home Force, so in the Mediterranean Command, sore throat, erysipelas, and rheumatism were much more prevalent in the naval, and ophthalmia in the military force.

VENEREAL DISEASES were more prevalent in the military than the naval force; but the difference was by no means so great as on the Home Station, a result probably of the police regulations in Malta. In both services these diseases were much less prevalent than on the Home Station; but while the reduction in the army is considerably more than half, in the navy it amounts only to one-third. It is worthy of note that the reduction in the army is much greater in syphilis than in gonorrhœa, the admissions by it being a mere fraction above the navy, while the relative prevalence of gonorrhœa is thrice as high in the former as in the latter, as will be seen by the following table:—

|                 | Naval Force.            |                              | Military Force.         |                              |
|-----------------|-------------------------|------------------------------|-------------------------|------------------------------|
|                 | Admitted into Hospital. | Ratio per 1,000 of Strength. | Admitted into Hospital. | Ratio per 1,000 of Strength. |
| Syphilis .....  | 4,529                   | 50·4                         | 5,616                   | 52·6                         |
| Gonorrhœa ..... | 1,337                   | 14·9                         | 5,665                   | 53·0                         |
| Stricture ..... | 336                     | 3·7                          | 277                     | 2·6                          |

The low ratio of cases of gonorrhœa in the navy is perhaps, as before pointed out, the result of the system of treating such cases without taking the men off the duty list. It is worthy of remark that, although the ratio of admissions by gonorrhœa is so very much lower in the navy, stricture of the urethra is relatively more prevalent than in the army.



TUBERCULAR DISEASES were rather more prevalent and fatal in the naval than the military force, and, the invaliding for these diseases from the former was more than thrice as high as from the latter. These results show a marked difference from those of the earlier period, when both admissions and deaths were much higher in the army—a result, it was supposed, of the greater facilities the navy then enjoyed for invaliding. If the cases of consumption and hæmoptysis alone be taken the proportion of admissions and deaths in the two services for the two periods were as follows:—

|             | 1830-36.  |           |       |                  |       | 1859-68.  |           |       |                  |       |
|-------------|-----------|-----------|-------|------------------|-------|-----------|-----------|-------|------------------|-------|
|             | Strength. | Admitted. | Died. | Ratio per 1,000. |       | Strength. | Admitted. | Died. | Ratio per 1,000. |       |
|             |           |           |       | Admitted.        | Died. |           |           |       | Admitted.        | Died. |
| Naval force | 55,709    | 432       | 108   | 7·7              | 1·94  | 89,910    | 887       | 166   | 9·9              | 1·85  |
| Military „  | 37,899    | 409       | 197   | 10·8             | 5·20  | 106,813   | 878       | 162   | 8·2              | 1·52  |

From this table it will be seen that there has been an increase of 2 per 1,000 in the admissions and a very trifling decrease in the deaths in the navy by these two diseases, while there has been a decrease of  $2\frac{1}{2}$  in the admissions, and of above  $3\frac{1}{2}$  in the deaths, per 1,000 of the strength in the military force, and the mortality of the soldiers by them, instead of being, as formerly, considerably more than double, has been one-fifth lower than that of the sailors, even with the invaliding thrice as high among the latter. Though it is difficult to trace precisely the causes to which such reduction is due, it seems probable that in this instance it has been to a great extent the result of the rotation system of reliefs by which corps, instead of serving ten years continuously in the Mediterranean, are relieved at the end of their third or fourth year. By this system the period of continuous service in the Command was assimilated in the army to that of the navy, and if the conjecture hazarded above be correct, with the most beneficial results.

DISEASES OF THE NERVOUS SYSTEM gave rise to a much higher ratio of admissions and invaliding in the navy than the army, but the mortality differed very slightly in the two services. The excess of the admissions was chiefly in cases of headache, and of inflammation of the ear and deafness, the two latter probably a result of the sailor's exposure to cold and wet. As on the Home Station, epilepsy and delirium tremens were found to be much more frequent among the sailors than the soldiers, as will be seen by the following table:—



|                       | Naval Force. |       |                  |       | Military. |       |                  |       |
|-----------------------|--------------|-------|------------------|-------|-----------|-------|------------------|-------|
|                       | Admitted.    | Died. | Ratio per 1,000. |       | Admitted. | Died. | Ratio per 1,000. |       |
|                       |              |       | Admitted.        | Died. |           |       | Admitted.        | Died. |
| Delirium tremens .... | 306          | 15    | 3'40             | ·17   | 236       | 10    | 2'21             | ·09   |
| Epilepsy .....        | 303          | 1     | 3'37             | ·01   | 258       | 4     | 2'41             | ·04   |

Thus, both these diseases are about one-third more prevalent among the sailors than the soldiers, but in neither service do they give rise to a high rate of mortality. Compared with the results for the seven years 1830-36, there has been a marked increase in the admissions by delirium tremens and a very slight decrease in epilepsy in the naval, but a moderate increase in both in the military, force.

Diseases of the circulatory system are rather more prevalent in the military than the naval force, but with a lower ratio of deaths. The ratio of admissions differs very little from that in the two services on the Home Station.

Diseases of the respiratory and digestive systems, and boils, abscesses, and ulcers, were much more frequent among the seamen than the soldiers, and in both services were much more prevalent than at home, with the exception of those of the respiratory system among the soldiers, which caused little more than half the proportion occurring among infantry in the United Kingdom. The excess of boils, abscesses, and ulcers among the sailors in the Mediterranean was very marked, the ratio of admissions being nearly double that of the Home Stations, while among the troops the increase was only one-fourth.

It has already been shown that the ratio of deaths from violence and accidents was nearly twice as high in the naval as in the military force. Of 223 deaths in the former, 77 were reported as caused by the men falling from aloft, 21 by objects falling on them, and 91 by drowning, leaving only 34 by other causes of this class. The difference in the mortality of the two services from accidents and injuries was nearly the same in the Mediterranean as at Home, the excess in the navy having been 1'12 per 1,000 of the strength in the former, and 1'17 per 1,000 in the latter. The invaliding of the navy for these causes, however, from the Mediterranean, was 1'99 per 1,000, while at home it was only 1'06 per 1,000 above the army.

To recapitulate briefly the leading facts brought out by these data, it may be stated that on the Home Station, omitting wounds



and injuries, the sickness has been one-ninth higher, the mortality  $\cdot 70$  and the invaliding  $2\cdot 28$  per 1,000 lower in the navy than the army. The result as to the mortality has been probably influenced by the much larger proportion of boys in the former. The excess of admissions in the navy has been chiefly from miasmatic diseases—particularly eruptive fevers, dysentery and diarrhoea, sore throat, and erysipelas; from diseases of the respiratory and digestive systems, from boils, abscesses, and ulcers, and from accidents; while in the army there has been an excess in ophthalmia, venereal diseases, and the group of unclassified diseases. The excess of mortality in the army has been principally in tubercular diseases and those of the respiratory system. Compared with previous periods, there has been a great reduction in both sickness and mortality, the former much more marked in the navy, and the latter in the army.

In the Mediterranean the sickness has been lowest in the army, and the mortality in the navy; but the invaliding from the latter has been nearly double that of the army. The excess of admissions in the navy has been chiefly in miasmatic diseases, particularly eruptive and paroxysmal fevers, dysentery and diarrhoea, sore throat and rheumatism, in diseases of the nervous, respiratory, and digestive systems, and in boils, abscesses, and ulcers; while in the army the admissions were higher from remittent and continued fevers, cholera, and ophthalmia, venereal diseases, and the unclassified group. The excess of mortality in the army was in miasmatic diseases, especially remittent and continued fevers, dysentery, diarrhoea, and cholera, and in diseases of the circulatory and respiratory systems, and the unclassified diseases; while in the navy there was an excess in tubercular diseases, and in boils, abscesses, and ulcers. The high ratio of invaliding from the navy was chiefly caused by tubercular diseases, but it was higher than in the army by all classes of diseases, except those of the respiratory system and the unclassified. Compared with the previous period, there has been a considerable increase in the admissions into hospital in the navy and decrease in the army, and a great reduction in the deaths in both services, much more marked however in the army than the navy.

A study of these leading features in the prevalence and mortality of the various groups of diseases in each service, would naturally suggest the direction in which further preventive measures must be taken.

Having thus endeavoured to show, as concisely as possible, the principal differences in the sickness and mortality of seamen and soldiers, so far at least as regards temperate climates, the improved position of both services in regard to health which has been realised during the last thirty years by judicious legislation, and the direction in which further efforts for this purpose may be made, it



may not be amiss, before concluding, to point out how much the army has been indebted to that science which it is the special object of this Society to cultivate, for an amelioration in the condition of the soldier, the extent of which, it is believed, has not yet been fully recognised and appreciated. It was not till 1835 that the numerical method of investigation was applied on a comprehensive scale to questions relating to the losses of the army by sickness, mortality, and invaliding, and it was not till 1838, when the first report on the subject was placed in the hands of the Secretary at War, that a succession of sanitary measures, based on the information thus acquired, was commenced. These investigations were continued for several years subsequently, until a series of reports, embracing all the colonies and dependencies of the Crown, except India, was completed, and many important changes introduced into the army in consequence. Although from unavoidable causes the preparation of a second series of these reports was interrupted after the publication of one volume, a *précis* of the information relative to the health of the army was annually prepared in the War Office for the information of the Secretary at War, and many important measures founded upon it were introduced. On the reorganisation of the Army Medical Department after the Crimean war, the importance of the statistical method of inquiry was recognised by the formation of a special branch, and from the reports prepared by it, the information relating to the army which has just been read has been compiled.

But it may be asked what has been the practical result of these labours of thirty-five years? When they were first commenced, the mortality of the army, so far as it could be ascertained, for the data were by no means perfect, amounted to at least 3 per cent. annually; on the average of the five years 1865-69, it was under  $1\frac{3}{4}$  per cent.—to speak precisely it was 16·55 per 1,000. Taking the strength of the army, exclusive of colonial corps, from the army estimates for 1871-72 as 184,000 non-commissioned officers and men, the difference in the mortality represents a saving of above 2,300 lives annually—a saving of no small importance, and representing, even at the lowest estimate of the cost of production of a trained soldier, a large sum of money, which would be necessary to replace these men. It must not, however, be supposed that this money value has been all realised in a reduction of expenditure; many of the improvements referred to have been effected by means of a large outlay, but even after making a very liberal deduction on this account, there will still remain a considerable pecuniary saving as a result of these measures. It should also be remembered that another consequence of this judicious expenditure has been to remove some of those objections to service in the army which rendered it



unpopular, increased the difficulty and consequently the expense of recruiting, and deterred a better class of men from joining its ranks. Nor must the reduced rate of mortality be entirely attributed to the sanitary improvements which have taken place—important though the results of these have been. There are other measures which have exerted a powerful influence in this respect, and of these may be specially mentioned the system of limited service introduced in 1849. But this in no degree detracts from the value of the benefits conferred on the army by statistical science, as the difficulties which stood in the way of that measure were, to a great extent, removed by it. One of the chief objections urged against limited service, or perhaps it would be more correct to say, one of the chief arguments adduced in favour of enlistment for life, was based on the theory of acclimatisation, the correctness of which was tested and disproved by statistical evidence in the earlier volumes of the reports on the health of the army.

Before concluding, I desire to record the names of those under whose auspices, and by whose judicious administration, results of so great importance, whether viewed in the light of humanity, finance, or military policy, have been obtained. I would specially note Sir James McGrigor, who, as Director-General of the Army Medical Department, organised those returns on which the first series of reports was based, and who, for upwards of twenty years, continued to collect them with a wise prescience that the time would come when their value would be justly estimated, and their important teaching be turned to account. Lord Howick (now Earl Grey) was the first Secretary at War to appreciate the advantages of statistics in the examination of the important health questions of the army, and to apply judiciously the knowledge thus acquired to ameliorate the condition of the soldier and increase the efficiency of the service. Mr. Fox Maule (now Earl of Dalhousie) following the course thus begun, not only continued and added to the sanitary improvements already initiated, but carried through Parliament the bill abolishing the system of life service, and thus removed from our Government the blot of permitting lads scarcely arrived at manhood—infants in the eye of the law in all other matters—to sell themselves for the remainder of their lives without even the power of redemption, unless accorded to them as a favour. Mr. Sidney Herbert (the late Lord Herbert of Lea), justly appreciating the labours of his predecessors, gathered into one harmonious whole the scattered facts relating to military hygiene, and in his reorganisation of the Army Medical Department, established as a permanent institution, a statistical branch for the working of that science which had already done so much in pointing out the direc-



tion in which sanitary improvement was required, and in testing the effect of those measures which had been applied with a view to the removal of the causes of sickness and mortality among the soldiers.

But while mentioning the names of those under whose administration these great measures were introduced, I must not omit to pay a just tribute to two fellow-workers, now passed away, to whom much of the success of these statistical inquiries was due. Dr. Henry Marshall, Deputy Inspector-General of Hospitals, was one of the first pioneers in those labours, of which the results have just been brought before you. To his practical knowledge of the numerical method of investigation, his sound good sense, his clear judgment, and his indefatigable industry, much of the early success which attended these inquiries may be attributed. Sir Alexander Tulloch was too well known to this Society to require any eulogium on the present occasion. For a quarter of a century he was actively engaged labouring for the benefit of the soldier; and during the time before referred to, when the publication of the statistical reports was in abeyance, on him devolved the duty of examining the numerous statistico-sanitary reports from all our foreign possessions, and submitting for the consideration of the Secretary at War such suggestions in them as seemed likely to be beneficial and practicable. The manner in which this work was performed may perhaps be best estimated by the confidence reposed in him by the various Ministers under whom he served, and by the valuable practical results of the measures which were based on his reports. Nor may I omit from the list of distinguished labourers in this field, the honoured name of Florence Nightingale, to whose intelligence and energy the army has been so deeply indebted. Although now a confirmed invalid, Miss Nightingale has given us recent proof, in her "Notes on 'Lying-in Institutions,'" not only that her intellect is as bright as ever, and that she continues to take a warm interest in great health questions, but of her continued faith in statistics as the sure basis for sanitary improvement, and of her great talent in applying the lessons deduced from its teaching.

I shall conclude, with the expression of a sincere hope that the science which it is our great object and delight to cultivate, may long continue to be appreciated by those in authority, and to produce results of a nature as satisfactory and as beneficial as those which have this evening been brought under your notice.

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## APPENDIX.

TABLE A.—*Royal Navy, Home* (see p. 4).

| Year. | Mean Strength. | Admitted into Hospital. | Died In and Out of Hospital. | Discharged as Invalids. | Mean Daily Sick. | Ratio per 1,000 of Mean Strength. |       |                         |                  |
|-------|----------------|-------------------------|------------------------------|-------------------------|------------------|-----------------------------------|-------|-------------------------|------------------|
|       |                |                         |                              |                         |                  | Admitted into Hospital.           | Died. | Discharged as Invalids. | Constantly Sick. |
| 1859  | 19,300         | 22,775                  | 188                          | 516                     | 968.9            | 1,177                             | 9.7   | 26.7                    | 50.2             |
| '60   | 23,500         | 25,670                  | 263                          | 690                     | 935.4            | 1,092                             | 11.2  | 29.4                    | 39.8             |
| '61   | 22,900         | 24,525                  | 220                          | 715                     | 1101.5           | 1,071                             | 9.6   | 31.2                    | 48.1             |
| '62   | 20,760         | 23,641                  | 173                          | 640                     | 1002.5           | 1,139                             | 8.2   | 30.8                    | 48.2             |
| '63   | 21,570         | 22,788                  | 153                          | 625                     | 989.3            | 1,056                             | 7.0   | 28.9                    | 45.8             |
| '64   | 19,630         | 21,028                  | 154                          | 636                     | 932.2            | 1,071                             | 7.8   | 32.3                    | 47.4             |
| '65   | 20,980         | 21,507                  | 151                          | 543                     | 954.5            | 1,025                             | 7.1   | 25.8                    | 45.4             |
| '66   | 21,200         | 20,961                  | 171                          | 554                     | 895.7            | 989                               | 8.0   | 26.1                    | 42.2             |
| '67   | 21,600         | 18,951                  | 161                          | 426                     | 814.6            | 877                               | 7.4   | 19.7                    | 37.7             |
| '68   | 23,200         | 20,695                  | 176                          | 510                     | 876.1            | 892                               | 7.5   | 21.9                    | 37.7             |
| Total | 214,640        | 222,541                 | 1,810                        | 5,855                   | 9470.7           | 1,037                             | 8.43  | 27.28                   | 44.12            |

*Infantry Regiments, at Home* (see p. 4).

| Year. | Mean Strength. | Admitted into Hospital. | Died In and Out of Hospital. | Discharged as Invalids. | Mean Daily Sick. | Ratio per 1,000 of Mean Strength. |       |             |                  |
|-------|----------------|-------------------------|------------------------------|-------------------------|------------------|-----------------------------------|-------|-------------|------------------|
|       |                |                         |                              |                         |                  | Admitted into Hospital.           | Died. | Invalided.* | Constantly Sick. |
| 1859  | 19,621         | 18,915                  | 149                          | —                       | 999              | 964                               | 7.59  | —           | 50.91            |
| '60   | 25,117         | 22,711                  | 250                          | 535                     | 1,210            | 904                               | 8.95  | 21.3        | 48.13            |
| '61   | 26,719         | 22,677                  | 205                          | 935                     | 1,232            | 849                               | 7.67  | 35.0        | 46.12            |
| '62   | 29,439         | 24,493                  | 197                          | 757                     | 1,344            | 832                               | 6.69  | 25.7        | 45.65            |
| '63   | 24,331         | 19,643                  | 188                          | 825                     | 996              | 807                               | 7.68  | 33.9        | 40.92            |
| '64   | 20,748         | 16,599                  | 182                          | 683                     | 864              | 800                               | 8.77  | 32.9        | 41.65            |
| '65   | 22,486         | 17,711                  | 169                          | 769                     | 969              | 788                               | 7.51  | 34.2        | 43.09            |
| '66   | 19,545         | 14,781                  | 140                          | 516                     | 724              | 756                               | 7.16  | 26.4        | 37.04            |
| '67   | 20,644         | 16,149                  | 179                          | 496                     | 769              | 782                               | 8.67  | 24.0        | 37.24            |
| '68   | 25,208         | 20,369                  | 201                          | 590                     | 929              | 808                               | 7.97  | 23.4        | 36.84            |
| Total | 233,858        | 194,048                 | 1,860                        | 6,106                   | 10,036           | 830                               | 7.95  | 28.50       | 42.92            |

\* Invaliding calculated on a strength of 214,237.



TABLE B.—Referred to on p. 5.

| Aggregate strength .....           | Naval Force, Home, 1859-68.   |       |                               |                  |       |            |
|------------------------------------|-------------------------------|-------|-------------------------------|------------------|-------|------------|
|                                    | 214,640.                      |       |                               |                  |       |            |
|                                    | Admitted<br>into<br>Hospital. | Died. | Discharged<br>as<br>Invalids. | Ratio per 1,000. |       |            |
|                                    |                               |       |                               | Admitted.        | Died. | Invalided. |
| Miasmatic diseases .....           | 39,842                        | 232   | 776                           | 185·6            | 1·08  | 3·62       |
| Venereal „ .....                   | 23,685                        | 9     | 232                           | 110·4            | 0·04  | 1·08       |
| Parasitic „ .....                  | 5,970                         | —     | 2                             | 27·8             | —     | 0·01       |
| Diathetic „ .....                  | 727                           | 37    | 38                            | 3·4              | 0·17  | 0·18       |
| Tubercular „ .....                 | 1,849                         | 424   | 1,082                         | 8·6              | 1·98  | 5·04       |
| Diseases of the—                   |                               |       |                               |                  |       |            |
| Nervous system .....               | 4,147                         | 130   | 960                           | 19·3             | 0·61  | 4·47       |
| Circulatory system .....           | 1,819                         | 176   | 717                           | 8·5              | 0·82  | 3·34       |
| Respiratory „ .....                | 33,097                        | 195   | 239                           | 154·2            | 0·91  | 1·11       |
| Digestive „ .....                  | 12,436                        | 96    | 740                           | 57·9             | 0·45  | 3·45       |
| Urinary „ .....                    | 552                           | 29    | 142                           | 2·6              | 0·13  | 0·66       |
| Boils, abscesses, and ulcers ..... | 47,327                        | 14    | 296                           | 220·5            | 0·06  | 1·38       |
| All other diseases .....           | 11,341                        | 8     | 189                           | 52·8             | 0·04  | 0·88       |
| Accidents and violence .....       | 39,759                        | 447   | 442                           | 185·2            | 2·08  | 2·06       |
| Causes not stated .....            | —                             | 13    | —                             | —                | 0·06  | —          |
| Total .....                        | 222,541                       | 1,810 | 5,855                         | 1036·8           | 8·43  | 27·28      |

| Aggregate strength .....           | Infantry Regiments, Home, 1859-68. |       |                                |                  |       |             |
|------------------------------------|------------------------------------|-------|--------------------------------|------------------|-------|-------------|
|                                    | 233,858.                           |       |                                |                  |       |             |
|                                    | Admitted<br>into<br>Hospital.      | Died. | Discharged<br>as<br>Invalids.* | Ratio per 1,000. |       |             |
|                                    |                                    |       |                                | Admitted.        | Died. | Invalided.* |
| Miasmatic diseases .....           | 31,781                             | 216   | 838                            | 135·9            | 0·92  | 3·91        |
| Venereal „ .....                   | 56,807                             | 21    | 295                            | 242·9            | 0·09  | 1·38        |
| Parasitic „ .....                  | 8,157                              | —     | 6                              | 34·9             | —     | 0·03        |
| Diathetic „ .....                  | 685                                | 20    | 35                             | 2·9              | 0·08  | 0·16        |
| Tubercular „ .....                 | 3,448                              | 558   | 1,299                          | 14·7             | 2·39  | 6·06        |
| Diseases of the—                   |                                    |       |                                |                  |       |             |
| Nervous system .....               | 3,666                              | 153   | 771                            | 15·7             | 0·65  | 3·60        |
| Circulatory system .....           | 1,887                              | 219   | 959                            | 8·1              | 0·94  | 4·48        |
| Respiratory „ .....                | 21,371                             | 274   | 647                            | 91·4             | 1·17  | 3·02        |
| Digestive „ .....                  | 7,754                              | 126   | 375                            | 33·1             | 0·54  | 1·75        |
| Urinary „ .....                    | 543                                | 34    | 61                             | 2·3              | 0·15  | 0·29        |
| Boils, abscesses, and ulcers ..... | 21,953                             | 4     | 84                             | 93·9             | 0·02  | 0·39        |
| All other diseases .....           | 19,661                             | 22    | 514                            | 84·1             | 0·09  | 2·40        |
| Accidents and violence .....       | 16,057                             | 212   | 215                            | 68·7             | 0·91  | 1·00        |
| Causes not stated .....            | 278                                | 1     | 7                              | 1·2              | —     | 0·03        |
| Total .....                        | 194,048                            | 1,860 | 6,106                          | 829·8            | 7·95  | 28·50       |

\* The ratio per 1,000 discharged as invalids from the infantry regiments, has been calculated on a strength of 214,237, the number discharged in 1859 being unavoidably omitted.



TABLE C.—*Naval Force, Mediterranean* (see p. 11).

| Year. | Mean Strength. | Admitted into Hospital. | Died In and Out of Hospital. | Sent to England as Invalids. | Mean Daily Sick. | Ratio per 1,000 of Mean Strength. |       |                        |                  |
|-------|----------------|-------------------------|------------------------------|------------------------------|------------------|-----------------------------------|-------|------------------------|------------------|
|       |                |                         |                              |                              |                  | Admitted into Hospital.           | Died. | Sent Home as Invalids. | Constantly Sick. |
| 1859  | 11,100         | 16,792                  | 125                          | 416                          | 571.7            | 1,512                             | 11.2  | 37.5                   | 51.5             |
| '60   | 14,210         | 20,915                  | 145                          | 988                          | 823.0            | 1,473                             | 10.2  | 69.5                   | 57.9             |
| '61   | 16,600         | 25,946                  | 172                          | 753                          | 1026.0           | 1,561                             | 10.4  | 45.4                   | 61.8             |
| '62   | 9,950          | 15,423                  | 97                           | 350                          | 554.1            | 1,550                             | 9.7   | 35.1                   | 55.6             |
| '63   | 8,470          | 13,844                  | 81                           | 363                          | 453.1            | 1,634                             | 9.5   | 42.8                   | 53.3             |
| '64   | 7,920          | 10,791                  | 62                           | 291                          | 356.4            | 1,362                             | 7.8   | 36.7                   | 45.0             |
| '65   | 7,240          | 10,051                  | 60                           | 249                          | 342.4            | 1,388                             | 8.2   | 34.3                   | 47.3             |
| '66   | 5,520          | 7,797                   | 30                           | 230                          | 276.2            | 1,412                             | 5.4   | 41.6                   | 50.0             |
| '67   | 4,800          | 6,424                   | 43                           | 139                          | 216.9            | 1,338                             | 8.9   | 28.9                   | 45.1             |
| '68   | 4,100          | 5,589                   | 36                           | 110                          | 210.7            | 1,363                             | 8.7   | 26.8                   | 51.3             |
| Total | 89,910         | 133,572                 | 851                          | 3,889                        | 4830.5           | 1,486                             | 9.46  | 43.25                  | 53.72            |

*Military Force, Mediterranean* (see p. 11).

| Year. | Mean Strength. | Admitted into Hospital. | Died In and Out of Hospital. | Sent to England as Invalids. | Mean Daily Sick. | Ratio per 1,000 of Mean Strength. |       |                        |                  |
|-------|----------------|-------------------------|------------------------------|------------------------------|------------------|-----------------------------------|-------|------------------------|------------------|
|       |                |                         |                              |                              |                  | Admitted into Hospital.           | Died. | Sent Home as Invalids. | Constantly Sick. |
| 1859  | 10,463         | 11,335                  | 141                          | 156                          | 517              | 1,083                             | 13.48 | 14.9                   | 49.41            |
| '60   | 11,559         | 10,478                  | 125                          | 137                          | 509              | 906                               | 10.81 | 11.8                   | 44.03            |
| '61   | 11,705         | 9,894                   | 119                          | 288                          | 564              | 845                               | 10.17 | 24.6                   | 48.18            |
| '62   | 11,452         | 8,966                   | 96                           | 245                          | 476              | 774                               | 8.38  | 21.4                   | 41.56            |
| '63   | 11,104         | 8,523                   | 69                           | 258                          | 464              | 716                               | 6.21  | 23.2                   | 41.79            |
| '64   | 10,935         | 8,471                   | 67                           | 273                          | 446              | 775                               | 6.13  | 25.0                   | 40.79            |
| '65   | 10,326         | 8,503                   | 260                          | 349                          | 416              | 823                               | 25.18 | 33.8                   | 40.29            |
| '66   | 9,787          | 7,490                   | 87                           | 191                          | 407              | 790                               | 8.89  | 19.5                   | 41.59            |
| '67   | 9,474          | 7,481                   | 154                          | 221                          | 389              | 790                               | 16.25 | 23.3                   | 41.06            |
| '68   | 10,008         | 8,343                   | 141                          | 224                          | 421              | 834                               | 14.09 | 22.4                   | 42.07            |
| Total | 106,813        | 89,484                  | 1,259                        | 2,342                        | 4,609            | 838                               | 11.79 | 21.93                  | 43.15            |



TABLE D.—Referred to on p. 11.

| Aggregate strength .....     | Naval Force, Mediterranean, 1859-68. |       |                              |                              |       |            |
|------------------------------|--------------------------------------|-------|------------------------------|------------------------------|-------|------------|
|                              | 89,910.                              |       |                              |                              |       |            |
|                              | Admitted<br>into<br>Hospital.        | Died. | Sent Home<br>as<br>Invalids. | Ratio per 1,000 of Strength. |       |            |
|                              |                                      |       |                              | Admitted.                    | Died. | Invalided. |
| Miasmatic diseases .....     | 31,421                               | 227   | 664                          | 349·5                        | 2·52  | 7·39       |
| Venereal " .....             | 6,202                                | —     | 144                          | 69·0                         | —     | 1·60       |
| Parasitic " .....            | 1,005                                | —     | 3                            | 11·2                         | —     | 0·03       |
| Diathetic " .....            | 177                                  | 8     | 20                           | 2·0                          | 0·09  | 0·22       |
| Tubercular " .....           | 982                                  | 169   | 1,105                        | 10·9                         | 1·88  | 12·29      |
| Diseases of the—             |                                      |       |                              |                              |       |            |
| Nervous system .....         | 2,610                                | 53    | 427                          | 29·0                         | 0·59  | 4·75       |
| Circulatory system .....     | 798                                  | 51    | 357                          | 8·9                          | 0·57  | 3·97       |
| Respiratory " .....          | 15,767                               | 46    | 115                          | 175·4                        | 0·51  | 1·28       |
| Digestive " .....            | 6,879                                | 45    | 402                          | 76·5                         | 0·50  | 4·47       |
| Urinary " .....              | 223                                  | 5     | 48                           | 2·5                          | 0·06  | 0·53       |
| Boils, abscesses, and ulcers | 38,271                               | 12    | 207                          | 425·6                        | 0·13  | 2·30       |
| All other diseases .....     | 4,350                                | 11    | 167                          | 48·4                         | 0·12  | 1·57       |
| Accidents and violence ....  | 24,887                               | 223   | 230                          | 276·8                        | 2·48  | 1·86       |
| Causes not stated .....      | —                                    | 1     | —                            | —                            | 0·01  | —          |
| Total .....                  | 133,572                              | 851   | 3,889                        | 1485·6                       | 9·46  | 43·25      |

| Aggregate strength .....     | Military Force, Mediterranean, 1859-68. |       |                              |                              |       |            |
|------------------------------|---|-------|------------------------------|------------------------------|-------|------------|
|                              | 106,813.                                |       |                              |                              |       |            |
|                              | Admitted<br>into<br>Hospital.           | Died. | Sent Home<br>as<br>Invalids. | Ratio per 1,000 of Strength. |       |            |
|                              |   |       |                              | Admitted.                    | Died. | Invalided. |
| Miasmatic diseases .....     | 33,975                                  | 611   | 521                          | 318·1                        | 5·72  | 4·88       |
| Venereal " .....             | 11,558                                  | 2     | 86                           | 108·2                        | ·02   | ·81        |
| Parasitic " .....            | 961                                     | —     | 1                            | 9·0                          | —     | ·01        |
| Diathetic " .....            | 454                                     | 14    | 15                           | 4·2                          | ·13   | ·14        |
| Tubercular " .....           | 1,032                                   | 169   | 403                          | 9·7                          | 1·58  | 3·77       |
| Diseases of the—             |   |       |                              |                              |       |            |
| Nervous system .....         | 1,877                                   | 54    | 330                          | 17·6                         | ·51   | 3·09       |
| Circulatory system .....     | 814                                     | 91    | 251                          | 7·6                          | ·85   | 2·35       |
| Respiratory " .....          | 5,285                                   | 68    | 214                          | 49·5                         | ·64   | 2·00       |
| Digestive " .....            | 4,506                                   | 60    | 169                          | 42·2                         | ·56   | 1·58       |
| Urinary " .....              | 241                                     | 20    | 19                           | 2·2                          | ·19   | ·18        |
| Boils, abscesses, and ulcers | 12,657                                  | 2     | 60                           | 118·5                        | ·02   | ·56        |
| All other diseases .....     | 7,466                                   | 23    | 198                          | 69·9                         | ·21   | 1·85       |
| Accidents and violence ....  | 8,658                                   | 145   | 61                           | 81·1                         | 1·36  | ·57        |
| Causes not stated .....      | —                                       | —     | 9                            | —                            | —     | ·08        |
| Total .....                  | 89,484                                  | 1,259 | 2,337                        | 837·8                        | 11·79 | 21·87      |



No. 12  
*J. Longmore*

SANITARY PRECAUTIONS TO BE OBSERVED  
IN THE MOVING AND CAMPING OF TROOPS  
IN TROPICAL REGIONS.

By Surgeon-Gen. W. C. MACLEAN, M.D., C.B., Professor of Military  
Medicine, Army Medical School, Netley.



*(For private circulation only.)*

## **Evening Meeting.**

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Monday, 16th February, 1874.

SIR T. GALBRAITH LOGAN, M.D., K.C.B., Director-General,  
Army Medical Department, in the Chair.

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### **SANITARY PRECAUTIONS TO BE OBSERVED IN THE MOVING AND CAMPING OF TROOPS IN TROPICAL REGIONS.**

By Surgeon-Gen. W. C. MACLEAN, M.D., C.B., Professor of Military  
Medicine, Army Medical School, Netley.

MR. CHAIRMAN AND GENTLEMEN,—I appear before you this evening in obedience to a call from the Council of the Royal United Service Institution, to address you on the "Sanitary Precautions to be observed in the moving and camping of troops in tropical regions." In the month of March, 1862, my colleague, Professor Parkes, addressed you "On the causes of Sickness in the English Wars, and on the means of Prevention." In the concluding sentences of his discourse on that occasion, Dr. Parkes congratulated you "that at last an enlightened policy has been initiated," and that "in the words of Robert Jackson, the prince of Army Surgeons, the health of the soldier had become 'a primary consideration of the State.'" And he added, "that it must be for the Army at large, and for the general public, to support exertions which, without their aid, would languish and disappear. It must be for us, in fact, not to forget the teachings of the past, but to make them ever living, that their warnings shall not be forgotten, and that their lessons shall not be unfruitful."



It is, I know, a matter of sincere happiness to Dr. Parkes, and to those who labour with him in this cause, to find that the "teachings" of the past, as unfolded by him in the lecture under notice, have not been "unfruitful," and that their warnings have not been "forgotten."

This country has been called on, sorely against its will, to send a small portion of its land and sea forces to chastise an enemy in a climate "where fleets are silently dispeopled and armies melted away," but, unlike too many expeditions that in bygone years have left our shores for a like purpose, the force sent to operate on the Gold Coast has been provided not only with the appliances of modern war, but with everything that science could suggest and the national resources supply, to maintain health and efficiency under the guidance of an Officer, who, to military qualities of a high order, adds knowledge of, and respect for, the art which aims at the preservation of life, and the mitigation of human suffering.

It will be more convenient, and save much repetition, if, at the outset, I dispose of certain matters of importance regarding dress, water, and alcoholic stimulants.

#### *Dress.*

An immense stride in advance has been made in the mode of dressing the British soldier; as I had on a former occasion an opportunity of showing in this hall, up to the time of the mutiny of the Bengal Sepoys, one dress was supposed to serve his purpose for duty in India and Canada. This is no longer the case; Officers and men are not now exposed to the rays of a tropical sun, dressed in a manner calculated immeasurably to add to the sufferings and dangers of such exposure; and all who are impressed with the exceeding importance of the subject had the satisfaction of seeing, for the first time in our history, a body of men embark for African service, as comfortably equipped for the climate and work before them, as sportsmen starting for the moors on the 12th of August.

I have to congratulate the Army on another improvement hardly second in importance to the one just mentioned, viz., a vastly improved system of accoutring the soldier. I had, on the same occasion, an opportunity of bringing before the members of this Institution the mischief wrought by the old regulation system, which, while it set at nought all considerations based on the anatomy and physiology of the human frame, was, as a necessary result, most objectionable from a military and financial point of view, from the costly inefficiency clearly traceable to its use. The "Pack-Committee," of which my colleague Dr. Parkes was an active member, after years of patient experiment, at last introduced a system which has solved in a very satisfactory manner both the military and physiological problems submitted to them. We have only to ask any old soldier who has felt the pinch of the old, and the ease of the new equipment, for his opinion on the change, to be satisfied, that little as those whose withers have never been wrung by the old regulation pack and belts may think of it, it is in the estimation of those who have studied the subject, the greatest boon that has been conferred on the soldier since defensive armour



was laid aside. The trials made of the new valise equipment in Prussia have elicited strong recommendations for its introduction into a service where efficiency is so much appreciated; and Professor Morache, of the School of Military Medicine, Val-de-Grâce, declares that the trials made in France are conclusive in its favour, and were so regarded, not only by the soldiers who carried it on marches extending to 32 kilometres = to 20 English miles, without any fatigue, but also by the Officers who superintended the experiments. It is true that the knapsack is not carried by the British soldier in India, but in the old system it was not the knapsack alone that was in fault; every part of the equipment was so contrived as to press with severity on the chest-walls, and to impede the functions of the vital organs within them. The improvements I have thus indicated release me from the necessity of saying more on the importance of allowing free movement to the organs of respiration and circulation, when men have to exert themselves in the heated atmosphere of the tropics.

#### *Water.*

It is hardly necessary to say that few hygienic points are of more importance than a supply of the best procurable drinking water for men on the line of march. If this is left to the discretion of the water-carriers in India, they will take it from the nearest available source. After all that has been said and written on this subject of late years, it must suffice to say, that impure water is capable of conveying into the system the poison of malaria, or the germs of dysentery or cholera. The testing and purification of water are now carefully taught to Army Medical Officers, who, under present regulations, are charged with the responsibility of seeing that this is done by all the means available; and in their efforts to effect this, they should be seconded and supported by those in military command.\* Filters, such as those contrived by Captain Crease, should be mounted on wheels, and the water-carriers, who attend to the wants of the men, should be obliged to draw their supplies entirely from them. Company Officers cannot be too watchful on this point, and should be diligent in instructing their men in the danger of drinking impure water by the way. Nor should a large supply for douching purposes be neglected. This is necessary at all times in hot weather, whether the men march by night or day. It is on this that Medical Officers place their chief dependence in the treatment of most forms of sunstroke by day, or syncope from great heat radiated from the soil at night. Every soldier marching in the tropics should have some form of pocket filter in his haversack.

#### *Spirits.*

If there be any point of military hygiene that may now be regarded as settled beyond doubt or cavil, it is this, that spirits are not only not helpful, but are hurtful to the marching soldier, everywhere I believe, but nowhere more so than in hot climates. The

\* The water at every station between Cape Coast Castle and the River Prah was carefully examined, and the best sources of supply selected by Surgeon-Major Gore.



evidence on this point is overwhelming. The Medical Officers of the French Army who have had great experience in the arduous campaigns in Algeria, denounce the spirit-ration as hurtful: and Dr. Morache, already quoted as a high authority on military hygiene, declares that unless coffee had taken the place of spirits, it would have been impossible for the troops to surmount the fatigues of what he justly calls *ces pénibles campagnes*. Were I the medical chief of an Army destined to take the field in a tropical climate, not a drop of spirits should, with my consent, accompany it, save what the requirements of the ambulance-service demanded. The evidence shows that wherever soldiers, by accident or design, have been cut off from the use of spirits on marches, on active service, in temperate climates exposed to wet and cold, or in the tropics to ardent heat, or in laborious sieges, they have maintained their health, spirits, and discipline far better than when the once-deemed indispensable grog was in daily use. My colleague Dr. Parkes, and the late Count Wollowicz, in a series of careful experiments on the use of alcohol carried on at Netley, and published in the Transactions of the Royal Society, have placed on a sure scientific basis what was before a matter of observation, and have established that alcohol, far from increasing the power of bearing fatigue, even when given in a quantity which many spirit-drinkers would deem within the limits of moderation, lessens muscular force; and a quantity in excess of this, it was shown, entirely destroyed the power of work. The reason, Dr. Parkes says, was twofold. There was in the first place *narcosis* and blunting of the nervous system—the will did not properly send its commands to the muscles, and the muscles did not respond to the will; and secondly the action of the heart was too much increased and induced palpitation and breathlessness which put a stop to labour. The inferences were “that even any amount of alcohol, although it did not “produce symptoms of narcosis, would act injuriously by increasing “unnecessarily the action of the heart, which the labour alone had “sufficiently augmented.” For fatigue, rest and food are the proper remedies. Alcohol given alone under such circumstances can only stimulate the already nearly exhausted heart to fresh exertion. Under some very exceptional circumstances it may be a matter of absolute necessity to do this, but even then we must follow Dr. Parkes’s rule, viz., to give spirits in small quantity, not more than an ounce of brandy, and if possible it should be mixed with Liebig’s meat extract, which has a great power of removing the sense of fatigue. Dr. Parkes even gives a formula which is worth bearing in mind for use under such circumstances, as for example, when troops, after a fatiguing march, are obliged to engage the enemy without time for rest and food, he advises two ounces of red claret wine, with two teaspoonfuls of Liebig’s extract in half a pint of water. Wine not being available, half an ounce of brandy or rum would be a good substitute.

I cannot leave this important subject without adding, that for twelve years at Netley, I have had unrivalled opportunities of studying the effects of habitual dram-drinking on the persons of our soldiers; and I add my testimony to the immense weight of evidence accumulated by medical men in civil and military life, to the effect that alcohol is one



of the most active agents in causing degeneration of the human tissues, in other words, disease, premature decay and death. If this be true, as I believe it is, those Officers who, by precept and example, strive to wean their men from the practice of this our national vice, may with truth be said to be engaged in a patriotic work, and to deserve well of their country. Let me ask you to look at this alcohol question from another point of view. I hold in my hand a copy of a work known, I dare say, to many present, viz., "The Sepoy War," being the Private Journal of General Sir Hope Grant, edited by Captain Knollys, R.A.; a modest record of very distinguished service. At page 108, we have the following passage, referring to the siege of Delhi. "In order to fight to perfection, British soldiers must eat, and they must drink. Would they drank a little less. There never appears to have been any lack of provisions, and vast quantities of spirituous liquors fell into our men's hands. Drunkenness became fearfully rife, entailing with it increased sickness, as well as a relaxation of discipline, which it was necessary to repress with an iron hand." We all know the stake played for at Delhi. It was the Empire of India. Mark how alcohol put the issue in peril. Mark also that from this danger we were saved only by that unrivalled power of maintaining discipline which British Officers have shown at all times, in all places, and under all circumstances.

#### *Coffee.*

It is almost superfluous to add that the best substitute for alcohol is coffee or tea. The French Military Medical Officers vaunt, and with justice, the superiority of the light wines of their own country over the more strongly brandied wines of Spain and Portugal, and they point to the fact, that when used in moderation, the aromatic principles and the various salts they contain, exercise an effect on the digestive organs which is alike wholesome and agreeable. With all this, the best of them give a decided preference to coffee. Morache, in particular, is emphatic in his testimony, and is even eloquent in its praise as an article of diet, a safe stimulant, an aid to digestion, and an efficient refreshment under fatigue. Coffee forms no part of the ration of the French soldier in time of peace; but Morache does not hesitate to urge its issue instead of brandy, and he instances certain regiments in which the custom of substituting coffee for the morning *petit verre*, had much advanced the cause of temperance.

That a cup of hot coffee is the best preparation for the fatigues of a march, is indisputable, and it should never be omitted. It is much better that the men should have it before leaving their ground, and not at the half way halt as was common in my time in India: it invigorates them at starting, protects, especially the young soldiers, against the griping abdominal pains to which they are subject particularly in the dark and chilly hour preceding the dawn, and the vigour it imparts helps the system to resist the miasm which at this hour is most freely evolved from the soil. It is worthy of remark that coffee was first issued to European troops for this very purpose,



on the advice of the great Larrey, during Napoleon's Egyptian campaign.

The chief enemies we have to guard against in tropical marches, are, malaria, dysentery, sun-stroke, cholera, and in the yellow fever zone, the terrible disease so named. Malaria is a poison given off by the soil under certain conditions. Dr. Parkes observes that "when a country is said to be '*unhealthy*,' it is simply meant that it is "malarious."

Malaria is a product of organic decomposition in soils, it is banished by the cultivating hand of man, by drainage, especially sub-soil drainage, and by such a system of agriculture as directs the energy of the soil to the production of healthy living vegetation. The skill of the chemist has never yet isolated this poisonous agent, we recognise it only from its effects on the organism, which have been known from very early times. It is the chief factor in the causation of the class of fevers known as intermittent and remittent, characterised by a remarkable impress of periodicity, and by a long catalogue of sequels in the shape of organic diseases, which may also be gradually developed without febrile manifestations. It acts with the greatest intensity on the human system in situations which are low and moist, abounding in vegetation undergoing decomposition, in jungly districts during or immediately after the rainy season, at the base of great mountain ranges, as in the terrais of India, those belts formed of detritus rich in organic matter retaining a large quantity of water and covered with rank vegetation. It is capable of drifting along plains to a considerable distance from its source, and aided by currents of heated air, it can ascend ravines in mountain ranges to an elevation of many thousand feet. Water absorbs it, and periodic fevers can be introduced into the system by drinking water thus contaminated. This absorbing power of water is often beneficial when a sufficient breadth of it is interposed between human habitations and its source. Belts of trees in like manner exercise a protective influence. An important practical point to be kept in mind is that so slight an elevation from the ground as the difference between the ground and the second floor of a house often gives comparative safety; nay, the difference between the level of the ground and that of an ordinary bed may often lessen the danger. How high must we ascend to get out of its influence? Supposing there be no local sources, such as marshes, and no ravines up which it may drift, safety may generally be obtained at an elevation of from 1,000 to 2,000 feet. The point of safety differs however in different regions of the globe. It is hardly necessary to give such familiar facts, but without some such statement, the precautions to be observed in marching troops through malarial regions would not be intelligible. In India the ordinary reliefs of troops are made in the season of the year when comparatively little malaria is evolved from the soil. There are jungles, to enter which at certain seasons is, if not death, certain fever, of the most dangerous type; the same place can at the proper season be traversed in perfect safety. Under the pressure of military necessity troops must sometimes be moved at all risks. I have known this done when no such necessity existed, and with the most disastrous



effects. A General Officer whose name became in Spain imperishably associated with a regiment he had often led to victory, was in command in Madras when his old regiment landed; anxious to show favour to the successors of his old comrades, he determined that the regiment should at once occupy the pleasantest and most healthy station in his command. To effect this: another regiment then occupying it, must of necessity march more than 200 miles to a bad station in the midst of the rains through pestilential jungles. This was pointed out, with the inevitable consequences. The General was inexorable; the march was made, and when the condemned regiment reached its destination, a hundred sickly men were all that were capable of bearing arms, the rest were buried by the wayside, or were in hospital prostrated by fever, dysentery, and disease of the liver and spleen. For all purposes of service, the regiment was blotted out of the army list, until it was re-made, merely to indulge what was at best a bit of good-natured sentiment. A malarious district having to be traversed it should be done quickly. Night marches, always hateful to soldiers of all nationalities, are not under such circumstances to be thought of. In all climates they are to be avoided. They deprive men of repose at the time when nature most demands it, and for this nothing can compensate; they involve depression of spirits; even the light-hearted French soldier loses all his gaiety as he stumbles through the darkness; a night march is twice as fatiguing as one made in the cheerful light of day, and above all, it exposes the system of the soldier, at the time when it can offer least resistance, to the insidious attack of malaria, then given off in greatest abundance from the soil. In such localities, the afternoon should be selected; the men should be fortified by a good meal, and at least 3 or 4 grains of quinine, and an evening meal of which hot coffee should be a part should await them at the end of the march. The camping ground should be selected with care; should be in the driest available spot, not near ravines or any watercourses, and if possible, to windward of marshes, or any other obvious source of malaria.

The rules regarding drinking water already given, should be observed with more than ordinary strictness. The tents should be closed on the windward side, but kept open to leeward at night. Until the malaria-tainted district is traversed, halting days should be dispensed with. The tents should invariably be supplied with tarpaulin to spread on the ground, and Officers should see that the men have their blankets to protect them from the chill night and early morning air, which, charged with malaria, would otherwise certainly bring on fever, or dysentery, or both.

Officers can, without difficulty, carry with them their gauze curtains, which they should use at night. The mechanical filtration to which the air is thus subjected is certainly, to some extent, a protection from malaria. When serving in China, I carried my own in the folds of my blanket, and invariably used them, even when sleeping in the open air in calm weather, thus securing, not only the advantage above hinted at, but protection from the attacks of insects—the well-known murderers of sleep in such regions. When with the Army of Exercise,



as it was called, assembled at Agra to coerce the Rajah of Gwalior, I well remember the surprise universally felt in camp on the arrival of the late General Sir Thomas Valiant, who, with his aide-de-camp, had traversed in safety the pestilential jungles which intervene between the Bombay frontier and central India. They owed their exemption from fever to double gauze blinds, kept closely drawn night and day, with which their travelling palankeens were furnished.

The length of marches in India is, on ordinary occasions—that is for the routine of the service—regulated by the Quartermaster-General's department, in communication with the Commissariat, who arrange with the District Civil Officers for the needful supplies. The march should average about ten miles, and on ordinary occasions should not exceed twelve. Sometimes, to escape camping in an infected or unhealthy locality, it may extend to fourteen miles. It is always, however, open to the Officer in command, on the advice of the Medical Officer in charge, on good and sufficient reasons by him shown, to modify the length of the march or change the camping ground, as circumstances may demand. Troops, under the guidance of Officers experienced in tropical service, have, however, when well fed and otherwise cared for, accomplished as much as thirty miles a day, and that for several days. This was sometimes done during the mutiny in Bengal; but the limit of human endurance is soon reached, if such a strain is kept up for many days. The 52nd regiment accomplished forty-two miles in twenty hours, part of the distance in the sun, marching ten miles more next morning, and engaging the mutineers at the end of it. Dr. Parkes, who records this fact, is careful to add, "that the men were dressed in light and suitable clothing." Under the old tight-fitting uniform of heavy red "shoddy," I believe such a feat would have been impossible, without dropping half the strength by the way.

I have already said that night marches, from any point of view, are not advisable. All the French combatant and Medical Officers of Algerian experience are unanimous against them, save for good military reasons, to which every other consideration must give way. The practice of dividing the day's march into two, with a mid-day's halt, is not to be commended. It is unpopular with soldiers, who infinitely prefer being called on to make some extra exertion to finish the day's work. In India, the practice occasions much additional labour on those whose business it is to pitch and strike the tents. It is, moreover, prejudicial to the beasts of burden, interfering with their proper time for food and rest, and it soon tells on their health and condition.

#### *Pace.*

On ordinary occasions, if the end of the march is accomplished by 8.30 or 9.0 A.M., the troops need not be *en route* before 4.30. The marching pace is regulated by order in all armies. Nevertheless, I have often heard old soldiers on the line of march say, that the walking pace of the Adjutant's horse had a good deal to do with it. Halts at the usual distances are, in the tropics, of paramount importance. To such an audience, it is unnecessary to say that a regiment will



march faster than a brigade, a brigade than a division, a division than an army. Yet, in practice, forgetfulness of this well-known fact often leads to unnecessary exposure of the men. When the halt, which lasts from ten to fifteen minutes, is sounded from the front, it should be repeated rapidly to the rear; if this be not done, the troops in the rear halt just as the march is beginning again at the front. They are thus either deprived of their rest, or the continuity of the column of march is broken while they get it.

During these refreshment halts men may sit, but should on no account be allowed to lie down. This rule should be stringently enforced, when marching in the sun. During the French campaigns, so many men perished from sun-stroke while so doing, that Marshal Bugeaud published an order forbidding it. The reason, I suppose, is this:—A thermometer placed *on* the ground, in the sun in India, will mark 160° F., two feet *from* the ground it will stand 40° lower—an enormous difference. It makes a great difference whether the column marches in close or open order. So dangerous is the former, that the medical authorities in India long ago brought it to the notice of the highest military authority, and, except under a real military necessity, no experienced Commander would ever subject his men to the distress and danger inseparable from it in hot climates. Marshal Ney, indeed, declares it to be unsafe anywhere. I need not occupy your time by enforcing the necessity for personal cleanliness. It is of the greatest importance everywhere to see that men, young soldiers in particular, do not become footsore.\* Non-commissioned Officers should be instructed to see to this important point, and by careful inspection to be sure that the under-clothing of the men is properly washed and well aired, more particularly on halt days, which should be allowed at least every fourth day, besides Sunday. If the families of soldiers follow their regiments, advantage should be taken of halt days to see that the country carts in which they travel and carry their luggage are unpacked, and their contents freely exposed to the air. Without this precaution, I have known them to become as unwholesome as some of the lodging-houses in our crowded cities.

#### *Dysentery.*

Dysentery has, time out of mind, been the scourge of armies. With

\* The lecturer here showed a pair of shoes, and remarked—I hold in my hands a pair of shoes that I daresay would provoke the contemptuous laughter of a London bootmaker. Few of us would like to walk down Bond-street with them, and the Guards would object to parade in them for guard-mounting at St. James's. Nevertheless, they enabled an Officer to make the journey between Simla and the Thibet frontier twice over, without the wearer being foot-sore. They have been used also in pursuit of the mountain ibex, and have given a secure footing in places where the happy possessor of a pair of London-made boots, in a similar position, would be hurled from the line of eternal snow into an abyss 10,000 feet below. The "uppers" are made, you will observe, of the woven hair of the mountain goat, the soles of the untanned hide of the ibex, and sewn on to an elastic cushion of the wool of the mountain sheep. Notwithstanding the hard service they have seen, they are still as good as new. This is the shoe worn by the whole of the inhabitants of the Khunawur district, where a foot-sore man is never seen, and where a London chiropodist would starve.



good hygienic arrangements it ought to be a rare disease in modern times in well-regulated camps. Army surgeons of the present day are well instructed in the means of prevention, both in moving and standing camps. The measures already detailed all act in this direction. The grounds used for camping along the great lines of military communication should be kept with scrupulous care, and the severest sanitary police discipline should be enforced by every regiment using them, otherwise a privy-atmosphere, of all things most dangerous to health, will surround the place. The latrines for both men and followers should be carefully attended to, disinfected, and filled up as soon as the troops leave the place. It must be kept in mind that the excretions of dysenteric and cholera patients are active means of propagating both diseases, and no pains should be spared to prevent the camping grounds being soiled by them. Want of care in this particular in past times was a fruitful source of mortality. To be brief, cleanliness of place and person, temperance, good food, and good water, are the chief means of prevention; while marching in India, soldiers must sleep on the ground, but the tents should, I repeat, always be floored with good tarpaulin to prevent dampness, and, where possible, clean straw should be added, and the bodies of the sleeping soldiers, not overcrowded in their tents, should be protected from the chilly night wind.

What is called the cholera-belt should be worn by all soldiers. It is a great protection against the chilly air which invariably precedes the dawn, and which often brings on in young Officers and soldiers, severe abdominal pains, often followed by diarrhoea. The modern treatment of tropical dysentery is highly successful. The mortality among those treated by it is considerably less than one-half of what it was within my own recollection; but to be successful, this treatment must be early, and all Officers should give their cordial support to the Medical Staff in enforcing early application for aid on the first symptoms declaring themselves; and should impress on the men the disastrous consequences of concealment, and vain efforts to quench their sufferings by a recourse to such stimulants as they can command.

#### *Sunstroke.*

The next danger to be guarded against is sunstroke. Military reasons sometimes compel troops to march in the sun. It is to be hoped the day is passed for parades in heavy marching order in the hottest part of a hot tropical day, such as are to be read of in our Indian annals, with results that, little as they were thought of then, would in the present day raise a storm of indignant remonstrance against the cruel pedantry of those who ordered them.

I have elsewhere shown that men will bear a high temperature in the open air with comparative impunity, provided, 1st, it is not too long continued; 2nd, that the dress be reasonably adapted to the temperature and work to be done; and 3rd, that the free movements of the chest be not interfered with. Sportsmen in India know this well. It is impossible to exaggerate the importance of dress and accoutrements, not alone in India but wherever troops have to make long



marches in the sun. On the 6th of July, 1760, towards the close of the seven years' war, Frederick the Great marched from Kloster Marienstern to the Spree, to reach Silesia, if possible, before the Austrian Field-Marshal, Daun. The soldiers were dressed after the rigid Prussian method of that day, which I take to have very closely resembled, in all its important details, the equipment we have just discarded, which in fact was a copy of the Prussian system. Mr. Carlyle, deriving his facts mostly from the German military historian Archenholtz, gives a terrible description of this march: "The windless day grows hotter and hotter; the roads are of loose sand, full of jungles and impediments. This was such a march for heat and difficulty as the king never had before. . . . The soldier, for his own health's sake, is strictly forbidden to drink; but as the burning day rose higher, in the sweltering close march, thirst grew irresistible. Crossing any of these brooks, the soldiers pounce down, irrepressible, whole ranks of them, lift water clean or dirty; drink it greedily from the brim of the hat. Sergeants may wag their tongues and their cudgels at discretion; showers of strokes, says Archenholtz, Sergeants going like threshers on the poor men, though the upper Officers had a touch of mercy, and affected not to see this disobedience to the Sergeants 'and their cudgels,' which was punishable with death. War is not an over-fond mother, but a sufficiently Spartan one, to her sons. There dropt down, in the march that day, 105 Prussian men who never rose again. And as to intercepting Daun by such velocity, Daun too is on the march; gone to Görlitz, at almost a faster pace, if at a far heavier—like a cart-horse on gallop; faring still worse in the heat, '200 of Daun's men died on the road this day, and 300 more men were invalided for life.'"

On the 8th July, 1853, a body of men, 1,200 strong, marched from Beverloo to Hasselt. They started at eight in the morning. Only 500 reached Hasselt in the evening, 19 perished *en route*, and a great number, in a state of furious delirium, were taken into hospital.

The 43rd Regiment, during the mutiny of the Bengal Sepoys, marched from Bangalore in the Deccan to Calpee in central India, a distance, by the route taken, considerably exceeding 1,100 miles. With the exception of a few brief halts by the way of a few days at a time, the march was made continuously, a great part of it during the hottest part of the year; the men being exposed to a very high temperature by night as well as by day.

Dr. Barclay, the surgeon of the regiment, while in a valley at the foot of the Bismangunge Ghat, observed the thermometer at 118° F., in the largest tents during the day, 127° in the smallest, and on one occasion he observed it at 105° at midnight. This terrible temperature and prolonged exertion, told with fearful effect on the men: long before they reached Calpee, they were reduced to the last extremity of weakness. When at the foot of the pass just named, cases of insolation were brought to the hospital tents at every hour of the day and night, and although a large proportion of them were recovered by prompt treatment, two Officers and eleven men died in one night and were buried under one tree in the neighbourhood of the camp. I could



multiply examples of the terrible power of the sun on soldiers in the field; the above must suffice. Examples of these gathered from the medico-military and naval annals of our own and other countries, I have given in the article "Sun-Stroke," in Russell Reynold's System of Medicine. But I cannot miss the opportunity of warning those inexperienced in tropical service, of the great danger of crowding soldiers in barracks, tents, or even ships at sea, in hot climates; direct exposure to the sun's rays is not the only way in which high temperature kills; it is often quite as fatal in the close ill-ventilated and crowded barrack dormitory, tent, or the main deck of a ship, as under the rays of a vertical sun. This suggests the question whether it would not be safer in such circumstances to dispense with tents altogether, and make the men sleep on the ground, or on such raised beds as they can extemporise from the materials at hand. No one can be more impressed than I am with the great danger under such circumstances as we are considering, and indeed any circumstances, of causing men to breathe the foul air of a crowded and ill-ventilated tent, and as the least of two evils I would sanction a bivouac in the open air rather than expose them to it. At the same time I must add, that so far as my experience goes, chiefly gained in India, it is opposed to the general practice, and in localities notoriously malarious, it is I am sure unsafe. I must only note here, in passing, a curious peculiarity in the behaviour of Frenchmen when under the influence of high temperature; viz., a disposition to commit suicide, seamen by throwing themselves into the sea, soldiers with their arms. In one of Bugeaud's marches in the province of Oran, 11 men destroyed themselves, 200 on the same march suffering from insulations. The thermometer taken alone, does not always indicate the danger. There are other facts not as yet very well understood, such as the nature of the soil on the line of march, whether or not it be covered with vegetation, the hygrometric condition of the air, its electric tension, and the state of health of those exposed. I have already sufficiently adverted to the effects of dress and accoutrements, the weights the soldier has to carry and the mode of carrying them.

What then are the precautions to be observed to minimize as far as may be, the dangers above indicated? They are briefly, loose and light dress, protection to head, neck, and spine, and, let me add, the abdomen also. I am informed by one of Dr. Livingstone's companions in his African travels, that they were all as solicitous to protect this region of their persons from the heat radiated from the soil, as their heads from the direct rays of the sun. For this purpose they used waist belts made of bunting, *white*, when they had it.\* Anatomists and physiologists, remembering the position of the great plexus of the sympathetic

\* The lecturer here remarked on the necessity of making that part of the cover of the soldier's cap, which protects the nape of his neck, not of one, but of many folds of white cotton cloth, which should come lower down on the shoulders than it usually does. He also produced a waist-cloth or Kummerbund, of the finest Rampoor shawl cloth, 30 feet in length, so light and flexible as not to incommode the wearer, and yet to give perfect protection to the abdomen. He also pointed out the universal use of this among the natives of India.



system of nerves, will understand the *rationale* of this precaution. Marches of moderate length, in open order and with frequent halts, the men being allowed to sit, but, for the reason already given, not to lie down. Personal cleanliness, an abundant supply of the best water procurable, for drinking and douching purposes, good food, and tea or coffee, instead of spirits, for refreshment. On one of the last occasions when Canton was occupied by British troops, there was an alarm at noon day, and the troops had to turn out. An Officer in command of a battery, thinking to do his men a kindness and to "fortify them" against what was before them, opened the canteen and gave each man a glass of spirits before starting; that battery had more cases of sun-stroke than all the rest of the force put together. Is it then advisable to drink water when exposed to the sun? With a good intention no doubt, the Great Frederick forbade this indulgence to his men, and we have seen what came of it. All sportsmen know that if they once begin to drink water, on the moor for example, obeying the first craving for it, they must go on so doing all day. If they resist, the inclination passes away, and they go on without suffering until they reach the luncheon basket by the side of a cool spring. This, however, is a different case from that of the laden soldier toiling in the ranks along a dusty road, half choked with dust, and sweating profusely. Water is then a necessity, and men, like the hart "heated in the chase," "pant" for it. The blood is every moment becoming heated, and but for the cooling effect of the enormous evaporation from the skin, would soon become super-heated, with effects fatal to the centres of nervous energy and power. It is parting also with its watery constituents, and nature cries aloud for its renewal. To withhold it under such circumstances is as stupid as it is cruel. It will surprise those who have no experience in such matters, that in sun-stroke the temperature of the human body will sometimes reach  $110^{\circ}$  F., that is within  $3^{\circ}$  of a temperature at which the albuminoid constituents of the muscular system coagulate, and late researches have shown that the sudden failure of the heart's action in some forms of sunstroke may be due to this very occurrence. This will explain why the modern treatment of insolation is mainly based on the rapid reduction of temperature.

Cholera is our next subject. During the greater part of my service in India, the belief prevailing in high quarters was, that cholera was like the wind "blowing where it listeth;" that nothing was known or could be known as to its origin, its movement, its propagation; it was felt to be a frightful evil, one that as it could not be cured, was to be endured. So long as this state of mind continued, measures of defence or precaution were deemed as futile as an attempt to get to the back of the north wind. If cholera was known to prevail along the route about to be traversed by troops moving both ways in the course of the usual reliefs, that was not considered a sufficient reason for interfering with the routine of the service. One regiment was sent on the track of an infected one (already carrying the disease from village to village along its route), occupying the same camping ground, soiled with the poisonous discharges from the persons of the sick. The whole atmosphere was tainted with the stench of the bodies of the wretched followers,



always furnishing the largest number of victims, torn from their shallow graves by obscene beasts of prey; but enough of this past, fruitful in scenes of horror on which I seek not to dwell. This was pre-eminently the pre-sanitary age. There is enough of mystery about cholera still; its exact cause we do not know, it may be we shall never know it. It may in the future, as it has in the past, elude all the most refined methods an advanced science can bring to the enquiry. For some years past many ardent minds have sought to look into this mystery in vain. Two young men in particular, singularly gifted with the philosophic spirit, and armed with all the means science can supply, were set apart for this honorable but dangerous service by the Professors of the Army Medical School, with the approval of the Home and India Governments; Drs. Douglas Cunningham and Lewis have laboured in this cause, and although their labours have not been unfruitful, and are still full of promise, nature has not yet been forced to yield her secret to the persistent enquiries of these young philosophers. For all this, we do not despair; and even if we are destined never to see the veil withdrawn that hides the mystery from our eyes, we believe that in time we shall learn how to restrain the ravages of this disease within narrow limits, if not to stamp it out altogether. We now know with some exactness its birth place, or, in the language of Dr. Bryden, an eager labourer in this field of enquiry "its endemic area," whence it starts on its "tours of invasion." The laws governing its movements are being patiently examined, the means by which it is propagated from man to man, and from one congregation to another, are being sifted and recorded, and although on such points there is much conflict of opinion, I am confident the truth will appear at last "with healing on its wings." Already the enquiry has not been unfruitful in important results. Four times in the course of last year did cholera effect a landing on our shores, in London, Liverpool and Southampton, from foreign lands where it widely prevailed, and on every occasion the energetic efforts of the local sanitary authorities stamped it out before it could establish itself in its old haunts, and carry death to thousands of our countrymen.

To make intelligible the precautionary measures I am about briefly to give, I repeat here what I have elsewhere written. From the carefully observed and recorded histories, not of one, but of many epidemics of cholera, not in India only, but in every country yet invaded by the disease, I believe that human locomotion is the means of its extension from one distant place to another; in other words, as Dr. Netten Radcliff has expressed it, "Cholera does not travel, but is carried;" while air and water are the main agents of its diffusion in the vicinity of a place into which it has been brought, aided often by the agency of infected clothing, bedding, or whatever has been contaminated by the excretions of those affected by the disease. Let this most pregnant fact, well insisted on by Simon, be kept ever in mind, viz., that where cholera is epidemic in any place, persons who are suffering from the epidemic influence, though, perhaps, with only the slightest degree of diarrhoea, may, if they migrate, be the means of conveying to other places an infection of indefinite severity. That



the "quality of infectiveness" is in the matters which the patient discharges, that if these matters undisinfected are permitted to mingle with the contents of drains or cesspools, the very effluvia from them may infect; finally that if the cholera contagion from the above or any like sources, gains access to wells or other sources of drinking water, it will infect large volumes of the fluid. With regard to infected clothing here is a well-authenticated fact. Towards the close of the last epidemic of cholera in Malta, a woman in attendance on a soldier's wife affected with the disease, purloined and secreted an article of under-clothing worn by the sick person; weeks after the death of the woman, and after the disappearance of the disease from the island, this unhappy creature put on the stolen garment, without washing or disinfecting it, caught the disease and died. In like manner washerwomen who have had to wash the linen of infected persons without previous disinfection, have thus caught the disease.

It was long one of the "mysteries" of cholera, that it often localised itself in a particular house, a particular block of barrack buildings, one side of a street, and so on. The "mystery" is frequently explained by a careful inspection, disclosing local sanitary defects, a tainted water supply, and in some exceptional instances, even tainted food. I well remember one block of barrack buildings at Arcot, in the Madras Presidency, a very cholera-haunted station. It was on a much lower level than the main body of the buildings. To one division of this block in particular the disease, so soon as it appeared in the station, returned with the regularity of the swallow. At last, the floor of this pest-house was dug up, and a drain, choked with frightful accumulations, was discovered, the existence and direction of which had been forgotten. The barracks were built in the days of Clive, when Arcot was a place of importance, and, in their construction, every principle of sanitation had been violated—in nothing more than in the direction of the drains, driven as we have seen through the very centre of a dormitory. Bearing the above facts in mind, let me urge, first, that troops should not be marched into an infected locality, or tainted district. By way of illustration, take an historical example "written for our learning," what is known as the Mhow Case. A detachment of artillery, with women and children, was ordered to march from that station to Poonah. It was reported to the General commanding the division that cholera prevailed on the route, and delay was urged on this ground. It, unfortunately, happened that this Officer, on a previous occasion for a like good reason, had delayed a movement of troops, for which he received a rebuke from head-quarters. Unwilling to expose himself to another, he allowed the detachment to march, which in due time entered the "tainted district." All the world knows what followed. A shocking mortality among men, women, children, and followers. The time had gone by when such untoward events could pass without notice. A great outcry arose all over India. It reached this country. The facts were commented on by the press and discussed in Parliament, and after an acrimonious correspondence between the General and the authorities, he was deprived of his command.

2nd. When cholera attacks in cantonments or on the line of march,



change of locality is a point of primary importance. Flight out of the tainted place is not left to anyone's discretion; it is now a standing order in India. The Shakesperian maxim, "stand not on the order of your going, but go at once," should be the rule of conduct; go, ere the men get tainted; go, before they become depressed and panic-struck, by the rapidity with which the disease carries off its victims. The move should be made to the driest soil, where cholera victims have not been—where, as Dr. Parkes puts it, "it is pure, impermeable, and uncontaminated."

3rd. It is advised, when overtaken by cholera on the line of march, to move at right angles to the line of the prevailing wind. The plan may be tried—it sounds very reasonable—and if it be true that cholera germs or dust are carried to great distances by the wind, it ought to be effectual. Knowing however, as I well do, that cholera takes little account of the wind, finding its way, as I believe, by human means, not much hastened by a favourable, or much delayed by a foul wind, I do not personally think much of the measure. Others, however, whose opinion is deserving of respect, think differently.

4th. If a tainted village be on the way, avoid it; and, above all, if a body of tainted troops be approaching, it must not only be avoided, but the ground they have encamped on, being highly dangerous, must not be even approached.

5th. If a river be in front, cross it quickly. Do not linger on its banks, for the disease evinces a disposition to cling to rivers, which is probably only another way of expressing the fact that it follows the course of human intercourse.

6th. Need I repeat once more all that I have said about jealous watchfulness over the sources of water supply, and the necessity of the careful purification of it? To the next and last point I attach the greatest importance, viz., frequent inspection of the troops, at least three times a day, by Medical Officers, to pick the men out in the first stages of the premonitory diarrhoea. The eye of the experienced physician will detect at a glance the tainted man, before he has a suspicion that anything but a painless diarrhoea affects him. This is the stage when treatment avails; check this at the outset, and the man is saved.

It is needless to repeat once more, that attention to the conservancy and disinfection of latrines is more necessary in this than in all other diseases which may attack troops in camps or on the line of march.

Yellow fever is the next and last subject to be briefly noticed. This terrible disease has a *habitat* of its own, viz., the shores of the Gulf of Mexico, and the northern and eastern shores of South America, and the islands of the Caribbean Sea. From this, its home, its "endemic area," it has often been imported into other regions with destructive effect, but has never established itself in any of them as an endemic disease. Unlike cholera, which can live and thrive at St. Petersburg as well as in Calcutta, yellow fever loves a hot climate; there is much evidence to show that it has never established itself in any climate



where the average temperature is below 72° F., and the late Dr. McWilliam, of the Royal Navy, one of our highest authorities on the subject, has shown that it is driven from the coast of inter-tropical Mexico between the months of November and March, when the mean temperature does not exceed 71° F. Humboldt was of opinion that yellow fever cannot exist at an elevation of 3,000 feet above the level of the sea. But the truth is that it has three times been imported into the mountain military station of Newcastle, in Jamaica, where, however, I must add, a most efficient *nidus* had been prepared for it by faulty sanitary arrangements. Again, cholera destroys men of all races with perfect impartiality. From some peculiarity in the organization of the negro race, they enjoy a certain degree of protection from yellow fever. Our Army records show this incontestably; the mortality among the black troops is as nothing compared to the whites from this cause. I have called your attention to the fact that cholera often operates in a limited area or "tainted district." One of the most fortunate circumstances connected with yellow fever is, that this is, in a much higher degree, one of its distinctive peculiarities, and I invite attention to it as of the highest practical importance to military men, as on it is based the chief measure of precaution. I have not time to give a brief summary of the evidence on this point, but from the earliest examples with which I am acquainted, down to that of the Lisbon epidemic, the different invasions of the terrible outbreak at Buenos Ayres, and that of Shrieveport in the United States, the disease has evinced no disposition to extend the area of its operations beyond the tainted district. The lesson this teaches us all is that in flight we must seek safety for those committed to our charge. At Buenos Ayres, safety was found a few miles outside the city; it was the same at Lisbon, and at Shrieveport; and Blair of British Guiana, who has written one of the best treatises on the disease, has recorded the same fact.

Whatever be the exact cause of this pestilence, which is as yet as obscure as that of cholera, one fact of primary importance stands out clear as noon day. It is emphatically a child of dirt; or, if this be going too far towards its filiation, an atmosphere of dirt is that which it loves and affects, and within which it confines itself. So long as New Orleans was an uncleanly city, yellow fever was an annual visitor. Whatever we in this country may think of General Butler, however little most of us would like to live under his rule, he did one thing for New Orleans, he vigorously enforced sanitary laws, and for nine years that city has enjoyed an exemption from the disease, a thing unknown in its previous history. Most of us know, by hearsay at all events, that Lisbon is not famous for that which is said to be near of kin to Godliness; Buenos Ayres, when at last, notwithstanding its attractive name, yellow fever was imported into it, was nothing but a network of enormous cesspools. The streets were covered with swill and offal. The water of the river was so affected by the fluids that drained into it, that fish died and were thrown upon the banks. The people drank the water, and met the same fate; Shrieveport was much in the same condition; and when yellow fever entered, a New Orleans physician



declared, that all who were seized with it dropped off like sheep seized with the rot.

Surely I need not point the moral?

Yellow fever is a disease with which our naval brethren have more to do than we have, now that so few troops are serving in its *habitat*. Naval Commanders and Surgeons know that when boarded by this unwelcome visitor, there is but one course to pursue, viz., to shape one for higher latitudes; and the sooner this is done, the better for the safety of the crew. In one word, by sea or land we must seek for safety in timely flight. This is a case in which discretion is certainly better than valour.

And now to conclude. It will be seen that I have not so much sought to lay down hard and fast rules; to say, "do this," and "don't do that," as to establish principles from which precautionary measures flow as their corollaries. In other words, within the narrow limits, of necessity assigned to me, I have given you, in merest outline, it is true, a sketch of the natural history of the diseases which assail us in tropical climates, in the belief that this is the true way when addressing educated men to teach them how to meet and disarm them. This is not the ordinary vestryman's view of sanitation, and let me add, of those who act as if they deemed the conciliation of vestrymen of more consequence than national health. To such, given any unsanitary condition, and it is, in their opinion, "the toss of a half-penny," whether the outcome be small-pox or "fever," under which term they lump up half-a-dozen diseases specifically different in their cause, their symptoms, their anatomical lesions, their portability, their treatment, and mortality—cholera, or any other item in Pandora's box.

I am thankful for the progress we have made, I am hopeful of conquests yet to be achieved by preventive medicine at home, abroad, by sea and land; but I cannot withhold the expression of my belief that until the vestryman's "view" of sanitation ceases to influence the minds of those who aspire to direct public opinion and to guide legislation on this subject, the cause of what our continental neighbours aptly call "State Medicine," and with it all that belongs to the health of fleets and armies, will not take the place in the administration of affairs, its importance in relation to the happiness and well-being of our country, demands.

The CHAIRMAN: We have listened to a very interesting lecture upon a very important subject, and one which involves not only medical but military points. As the Sanitary Schoolmaster has been abroad so long, not only in private life but also in the Army, perhaps some officers or gentlemen whom I see present may be disposed to offer some remarks upon the points contained in the lecture.

Captain LUARD, R.E.: There are one or two points in the lecture that, with your permission, sir, I will comment upon. I think the most remarkable point was with reference to the height above the sea at which camping stations and garrisons should be placed, and this bears more especially on our position at the present time on the Gold Coast. We have been maintaining garrisons all along the Coast in positions which we know are not sanitary; but the probabilities are that, in future, stations could be selected on that Coast where troops could remain without any chance—or at least with much less chance—of their suffering from the terrible climate. We know that in the district of Akropong there are hills and uplands varying from



1,000 to 1,500 feet in elevation. The probabilities are that, if the troops were concentrated in that part, they would still be able to maintain a military control over the whole Coast. There is nothing, probably, from which soldiers suffer more than from drought, and anything which would tend to preserve them from thirst during campaigns and during marches is of the utmost importance. The lecturer commented on a beverage which he strongly recommended to troops, and that was coffee. Now some years ago I was hunting chamois in a very hot season of the year, and it was a most important thing to ascertain what was best to drink. We tried coffee and tea and cocoa; and my friends and I were unanimously of opinion that cocoa was far superior in enabling us to resist thirst to anything else. The use of spirits was entirely, as I understood, tabooed by the lecturer, but I would ask whether a very slight modicum of spirits mixed with the cocoa or coffee would be hurtful to the troops. My impression has been that although raw spirits are undoubtedly very bad for men, injuring the coats of the stomach, yet, mixed with soup or coffee, they are not deleterious in their effects, and are occasionally beneficial.

SIR WILLIAM CODRINGTON: There is one matter with regard to the clothing of troops. As long ago as 1842 I think, the Government gave to every soldier in Canada his fur cap and his mocassins at a cost of £3 to the country as an addition to his kit.

DR. MACLEAN: What I had particularly in view was this, my colleague, Mr. Longmore, professor of Military Surgery at Netley, who served with the 19th Regiment in India, has often told me—in fact it is now in print—that he took the trouble to weigh the clothing sent after the regiment to Calcutta, which arrived in the dog-days to be served out to the men; he found that it was actually heavier than the clothing which had been issued to his own regiment whilst serving in Canada. Of course I did not allude to the external clothing superadded to that, but merely to the ordinary dress. In the case of the 19th Regiment, that certainly was so—the clothing served out in Calcutta, weighed more than that which had been issued to the same regiment in Canada.

SIR WILLIAM CODRINGTON: I imagined that you mentioned there was no change in the dress in Canada.

DR. MACLEAN: I was referring to the ordinary uniform, not to great coats and such like additions.

MR. G. W. COCKBURN: If not intruding on the meeting, I would support what the lecturer said about the unadvisability of commencing to drink in hot climates, and how well I know the truth of his assertion that every true sportsman knows the danger of commencing to drink, in hot climates. I think we may learn a great deal from the natives of those countries; and I can also speak from experience, having kept the fast of Ramazan with a certain Mussulman regiment in India, who urged the fact that they were keeping the fast, against doing any work. I accordingly kept the fast myself with them, so that I might say "I am keeping the fast myself, so we will go along together." The fast was kept from the first dawn of day until sunset; and the abstinence from drink was much more difficult to bear in the hot weather than the fasting from food. No Mussulman, as soon as the sun sets, thinks of quenching his thirst by taking a drink first; but he takes a small piece of salt and eats it, and he always takes a bite of food of some sort. The necessity of doing this should be always urged on our troops, whenever they halt, viz., to eat a little before they drink, as then the drinking will not bring on that fearful thirst, which, even the purest spring-water in the Himalayas will do, if you once commence to drink. If you commence to drink very early in the day, you will have raging thirst all the rest of the day; but if you resist that temptation to drink and take a small mouthful of food first and then drink afterwards, the effect is very different. I learned this very notably on a certain long march in a region I have no doubt well known to the lecturer, to the top of the hill near Simla. I was very anxious to get there in a very short time; and, before starting, an old lady had told me that gingerbread nuts were a great thing to keep down thirst, and insisted on my putting some in my pocket. I laughed at the old lady's story and did not believe in it at all. The following day we had to start at two o'clock in the morning. I got nothing to drink; and marching in the month of May, although in the hills, is extremely hot work in the sun. I had a bottle of cold tea, which I would not touch myself, because if the



men had seen me doing it they would have said that I was drinking and they were not, and would have made that an excuse for any further advance. I was very nearly dead with thirst at one time, when I thought of these ginger-bread nuts. I put a small piece of one of them into my mouth; I found to my astonishment that I went on with perfect ease afterwards. This is an old woman's recipe, but it is a very good one; and if the soldiers were furnished with ginger-bread nuts or a biscuit on these long marches and told to eat a small piece of that before they drank, I will guarantee from my experience, that drinking would not have the same effect of bringing on a raging thirst.

MR. RAWLINSON, C.B., C.E.: I hope I shall not be obtruding myself upon this meeting, this being a medical question, for I can only speak upon it from an engineering point of view; but I may, however, speak with some experience, seeing that I have been one of the Inspectors of the Board of Health since its formation in 1848, and that I had the honour of being appointed engineer to the Sanitary Commission sent out to the Crimea (1855). With regard to provision to be made for armies on the march, I am not going to occupy your time with any story of my own about that. I would simply supplement some of the lecturer's remarks with regard to the care that is necessary; and I will state briefly some regulations that I found neglected in the Crimea. I am speaking in the presence of Sir William Codrington, and I simply wish to explain certain regulations which I considered necessary, but which were neglected. The water supply of the camp at the front was obtained from natural springs and from ruined wells. The natural springs at the beginning of the second summer were in a muddy condition. There had been no attempt made to store the flow for 24 hours. The men drew water indiscriminately as they could get it. There was no regularity in the order of drawing, but each man drew as he went to the spring, the result being that the water was muddy from morning till night. It was the same with the wells. They were also drawn from indiscriminately from morning till night. The water slopped over the bank, went back again, and so contaminated the water. It did seem to me that it was so easy to remedy that state of things that in future it ought never to exist; as that whenever an army occupied a country, even for a brief space, the first thing to be done should be to put a guard upon the sources of water supply, and that the drawing of the water should not be done by the men individually but by orderlies told off for this purpose, and that some simple tank expedient should be adopted to economise the water for 24 hours. With regard to the watering for the cavalry camp, there were some 12,000 horses, and there were rows of watering troughs erected for the horses to water from—ten or twenty in a row; the water was run into the top trough, and then fed into the next, and into the next, and so on, the result being that before the water got half way down, the horses coming to the lower troughs would not drink it. This might have been obviated by a very simple expedient, for a small trough-spout or pipe might have been carried down in a line with the row of troughs with a small feed into each trough which would then have given an independent supply without its passing through any second trough.

With regard to the huts sent out to the Crimea, the roofs were covered with patent felt. Unfortunately for the soldiers, felt being waterproof was also air-proof, and no adequate provision had been made for ventilation. That was, however, sought to be remedied in different ways by the different medical officers of the different divisions; but I do not think any of the plans were entirely successful. The remedy that we recommended (and which was carried out) was to cut a slit in the roof, and then to cover it with a louver-board raised about an inch above. If in the huts sent out to Africa the same form of roof has been continued, and that remedy has not been provided for giving ventilation, those huts may afford shelter to the men, but they will, at the same time, breed fever. So much was that the case, that some huts in the Crimea were emptied, as every man went down with fever when they were kept at the full charge of 25 men to each hut. With regard to cholera and what may cause cholera that is a question I am not going to enter into, excepting so far as to state that it has been my fate to examine almost every seat of cholera in this country, and whatever may be the cause of cholera, as the lecturer has remarked, it cannot be said (independently) "to travel," or "to jump," or progress in other similar ways described in many, even medical, reports, such as "passing mountains,"



"running up rivers," and "marching over plains." It requires human intercourse. It follows the human being; it is attached to him; but there may also be something else besides the human being to cause cholera. After investigating one site of cholera after another in this country, and thinking "Now I have found something about it; now I know something about it," I was driven from every post—one after another—and had to come to the conclusion at last that I really knew nothing about it, except that it had an affinity for dirt. There was the instructive case of the town of Alnwick. The medical officer there jotted down upon a map every case of cholera and of cholera death, and in looking over the map and examining the ground I found that cholera had fastened upon the site where the back land drained into and through the basement; where the houses built upon the slope had the fall away from them, they were exempt. At the backs of the houses were great heaps of ordure and refuse, and the sub-soil becoming tainted beneath the basement, the atmosphere of the interior had become contaminated with foul vapour. As to cholera crossing a river, the lecturer has explained that there was a large traffic of human beings on the one side and little or none upon the other. I remember a French commission inquiring into the cause of cholera, and it came to the conclusion that cholera did not prevail upon the granites. I said, "Have you much population in France upon the granites?" "No." "Then, how can it prevail there?" I said. One of the most severe cases we had in England was upon granite. It was at Megavissy, in Cornwall, where one-tenth of the inhabitants died in a month; so that stratification has little to do with cholera. With regard to clothing conveying cholera, and with regard to the notion of woollen garments being specially impregnated with virus, let me tell the lecturer one fact. At the time I was Chairman of the Rivers Commission I was holding an inquiry in Yorkshire where the manufacture of shoddy was first perfected. I had before me medical men who remembered the introduction of shoddy, which is old woollen garments, gathered from every dirty quarter of the globe—Egypt, Poland, &c., to the extent, that year, of 35,000 tons of shoddy, and principally into that district. I said, "Have you disease when you break open these bales and handle these woollen rags?" "Not one single case." I said, "Are you quite sure?" "Not a single instance within our knowledge." There was an experiment upon a gigantic scale, whether or not the virus, or whatever it may be that impregnates woollen clothing, for I am not going to say that a woollen garment taken from the back of a cholera patient and immediately put in contact with another, may not carry the disease, but whether length of time or ferment destroys the virus, and how long it takes to do so, is really a question well worth inquiring into. Inquiry has been made with regard to small-pox and linen rags, and the commission found that there was only one small paper manufactory where small-pox had broken out, and there the commissioners could by no means fasten the outbreak upon the linen rags.

With regard to water and cholera, I know something about the water supply of India. Having the honour to serve upon the Army Sanitary Committee, it is my fate to glance over the reports from every part of India, and that cholera should prevail in India, that fever should be rife in India, and disease in excess, need not astonish any person who will take the pains to look at those reports. Anything more abominable, more horrible, than the water supply of India generally cannot by any possibility be conceived. Many of the wells are so tainted by the water filtering in from the tainted sub-soil as to be utterly unfit for any form of use. And again, the Hindoo has a ready facility of committing suicide, and in one of the provinces it was found that in one year some 1,700 bodies had been taken out of wells and tanks used by the inhabitants of that district. Attention is now turned to it, and analyses have been made by hundreds, I may almost say by thousands, and means are being taken to improve the water-supply of India, and as that improvement takes place, I have not a doubt but that the mortality will be reduced. I entirely agree with the lecturer as regards the use of spirits, and I am delighted beyond measure to hear him denounce any use of spirits as a ration for soldiers in the field. I am fully satisfied that doing away with the use of spirits both for our Army and Navy (other than as a medicine), will be one of the greatest improvements.

Sir W. CODRINGTON: I may mention that it was in times of great difficulty that the Sanitary Commission came out to the Crimea. There was the difficulty



of getting up huts, the difficulty of getting provisions, and the difficulty of getting water. I think that these things have not been quite considered in the statement that has been made to-night by Mr. Rawlinson. (Mr. RAWLINSON : I did not wish to cast any censure.) I do not mean that at all.

Mr. RAWLINSON : I only say, if I had to do with an Army in the field, a well or other source of water should never be left to be indiscriminately drawn from, as was the case in the Crimea ; there ought not to be a single case of it in future.

Dr. MACLEAN : I have really very little to say in reply in addition to what I have already said. I believe I am quite at one with the gentleman who has just addressed us on so many points connected with sanitary matters in India, and more particularly with what he has so forcibly stated with regard to the water supply there. I did not go into all the details, but I am thoroughly acquainted with the truth of the facts that he has just stated, more particularly what he referred to just now with regard to the enormous number of suicides, particularly of women, in the wells and tanks of India. In the place where I myself did duty upwards of eleven years when I was attached to the Residency at Hyderabad in the Deccan, in the wells of the immediate vicinity of that great city, suicides took place in the way described by Mr. Rawlinson at the rate of three or four a night and frequently more. I would wish also to observe with regard to what was said about the non-introduction of cholera by shoddy that the instance I gave of the disease having been transmitted from one person to another, was exactly such a case as Mr. Rawlinson allowed might possibly be an exceptional one. This garment had not only been used by a person sick, but was tainted in the way in which you might naturally expect, and it had not been exposed to the air until it was again used and in that way we can very well understand that the germs of cholera or whatever you may choose to call them may have retained their vitality.

I should merely like to add that the blanket that you see before you, formed the side walls of a tent used by the Officer whom I have previously mentioned. The tent was in use for upwards of ten years, in very unhealthy localities, in the deep valleys of the Himalayas. The blanket was found to be capable of resisting any amount of rain, and, when exposed to the severest tempests, the tent was perfectly dry, and—what was noticed as a thing of very great importance—it also acted as a mechanical filter to the air ; and the gentleman and his wife, who inhabited it for many years, never suffered from malaria. It is a notable fact that the people who live in the district I have mentioned, when they are obliged to sleep in malarious regions, invariably use a sort of mask made of the same material, though somewhat finer ; having been taught by experience, the immense importance of filtering the air and thereby protecting themselves.

The CHAIRMAN : I am sure you will allow me to return your thanks to Dr. Maclean for his very interesting lecture, in which he has laid down maxims that may act as guides for the future. A more able or more philosophic lecture we could not have had, and I have great pleasure in conveying your thanks to Dr. Maclean.



SO. HAMPTON  
NO. 1



*J. Longmore*

No. 13.

*(My only remaining copy)*

ON THE GENEVA CONVENTION OF AUGUST  
THE 22ND, 1864,

WITH SOME ACCOUNT OF THE NATIONAL COMMITTEES  
FORMED FOR AIDING IN AMELIORATING THE CON-  
DITION OF THE SICK AND WOUNDED OF ARMIES IN  
TIME OF WAR.

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A LECTURE DELIVERED AT THE ROYAL UNITED SERVICE INSTITUTION.

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*(Authors alone are responsible for the contents of their respective memoirs.)*



61



## LECTURE.

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Friday, March 16th, 1866.

MAJOR SIR HARRY VERNEY, Bart., M.P., in the Chair.

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ON THE GENEVA CONVENTION OF AUGUST THE 22ND, 1864, WITH SOME ACCOUNT OF THE NATIONAL COMMITTEES FORMED FOR AIDING IN AMELIORATING THE CONDITION OF THE SICK AND WOUNDED OF ARMIES IN TIME OF WAR.

By Deputy Inspector-General T. LONGMORE, Professor of Military Surgery at the Army Medical School.

The CHAIRMAN: I have the pleasure of introducing to you Professor Longmore, Professor of Military Surgery at the Royal Victoria Hospital, Netley. He has seen a great deal of service in the Crimea, and he has given particular attention to the subject which he brings before us to-day. Professor Longmore was sent by our Government to the Conference which was held at Geneva two years ago; and I beg to mention to you that this morning Miss Nightingale said to me, she thought there was no person better qualified to give an opinion upon the subject, and to discuss it, than Professor Longmore.

Professor LONGMORE: In the early part of last winter it was intimated to me that the Council of the Royal United Service Institution desired to have a lecture on the subject of the International Congress, which was held at Geneva, in 1864, for ameliorating the condition of the wounded soldiers of armies in the field by obtaining a treaty for their neutralization, and I was asked if I would undertake its delivery. I acceded to the request without hesitation, and I did so for two reasons. The first was that I knew there existed no little misapprehension in the minds of some persons in this country respecting the objects of this Congress, and considerable doubt as to the practicability of carrying into effect the terms of the international treaty which resulted from it; the second was, that having had the honour of being sent to the Congress as one of the representatives of the British Government, and, moreover, having acted at the Congress as one of the members of the sub-committee, whose duty it was to weigh carefully the written terms in



which each article of the Convention was expressed, I felt I probably possessed the means of removing some of the misapprehensions to which I have referred, and of showing that the treaty contains nothing which is impracticable or inconsistent with national or military requirements. It also appeared to me that I might, perhaps, be of use by calling attention to the advisability of steps being taken in this country for the formation of a national committee, similar to the committees which have been formed in most other European countries, for aiding their respective Governments in time of war in ministering to the necessities of sick and wounded soldiers. I am impressed with the importance of the subject being considered now, while we enjoy the leisure of peace; and of the committee, if one should be formed in this country, being organised and directed by persons holding positions of social weight and influence, as well as by officers possessing extended military experience; so that whatever preparations may be made, or course of action resolved upon, the steps taken in case of war breaking out may be uniform, may be such as will excite sympathy and confidence in the nation at large, and, at the same time, such as will harmonize with the necessities of campaigning and the general arrangements of military service. Keeping the several objects I have named in view, I propose, 1stly, to lay before you a brief sketch of the circumstances which gave rise to the International Congress in 1864; 2ndly, to explain the results of the Congress, as exhibited in the articles of the Convention acceded to by Her Majesty's Government; and, 3rdly, to describe the functions of the National Committees which have been formed in the principal countries of Europe, as well as to submit a few reasons for the establishment of a similar committee in this country.

Firstly, then, as to the *history* of the Congress. No one who studied the moral and political progress of a nation can fail to notice the prominence of certain successive periods in its history, within each of which a general condition has been arrived at, notably favourable for the development of some fresh and important advance in civilisation which has followed. It seems to be similar in moral progress to what we often observe in the progress of physical science, which, owing to successive additions to its stores of knowledge, and to concurrent circumstances, from time to time reaches such a stage of improvement, that important discoveries, or valuable applications of the information already gained, spring from it, almost spontaneously, as it were, and occur to the minds of several individuals nearly at one and the same moment. The apostles of moral and political advancement, whose names are household words among us, have, in frequent instances, owed their success and influence, not merely to their own zealous efforts, but also to the fact that they raised their voices at a time when many had become prepared and well disposed to listen; whereas others, equally zealous, and of equal power, had previously failed in advocating the same doctrines, because the period favourable for their reception had not yet arrived.

So it seems to have been in respect to the International Congress and treaty of which we are now speaking. There was nothing in the



objects of the Congress, there is no provision in the treaty, which has resulted from it, which had not been previously advocated by able and earnest men of various countries. Not only had individuals advocated, but in some instances the commanders of armies in the field had of their own accord agreed to and carried into effect, the principles embodied in the articles of the Geneva Convention. Such instances, however, have been few, and are remarkable as exceptional cases. The fitting time has only recently arrived for what was exceptional to become the rule, for such topics as those which are embraced in the Geneva Convention to excite general interest, and to be held to be of sufficient importance to European Governments to enter into a treaty respecting them. We must look to the vast increase in the means of diffusing information; to the facilities for rapid personal intercommunication; to the general attention now paid to the great events which stir mankind, of which wars are among the most stirring in their nature and their consequences; to the spread of more civilised and humane feelings, and the abatement of national animosities; and to the higher estimate of the value of life everywhere, if we seek for an explanation of the altered circumstances of our times in respect to the matters of which I am speaking.

The moral influences, no less than the military circumstances of modern battles are greatly changed by the changed conditions of things around us. While the names of the killed are hardly known at the place of action itself, while the numbers of the wounded are scarcely counted, electric messages inform the world that a battle has been fought, that a victory has been achieved, or a reverse sustained. The fears and hopes of thousands are at once excited, and general sympathy is awakened. While the wounds of the wounded are still recent, and the lives of many who are under the care of the military surgeons are still trembling in the balance, private communications from comrades, or from friends who have hastened to assist in the relief of sufferers, and public accounts multiplied and diffused far and wide by the press, rouse the attention of all ranks of society to individual concerns, and to detailed incidents of the conflict, to an extent which was unknown, and, indeed, impossible before the existence of telegraph wires, railroads, steam, and of all the machinery for the rapid diffusion of intelligence and personal observations, which exist in our epoch. In former days the *general* results of war were made public, the knowledge of *personal* circumstances was exceptional and limited to a narrow sphere; now the personal are almost as widely known as the general results. No wonder, then, on the one hand, that in former days the evils of war, being regarded as incapable of mitigation, or being unknown until all power of affording aid was passed, were left to be dealt with entirely by the governing authorities; or, on the other hand, that in our time public sympathy has sought to lessen these evils by committees of relief, by volunteer assistance, by donations of materials, by patriotic associations for the support of widows and orphans, by the special employment of soldiers disabled for ordinary occupations, and by various other means too numerous to be mentioned; or even that the mitigation of the rigours



and sufferings of war should be thought worthy of being made an object of international concern.

It was undoubtedly to the direct influence of the work, written by Monsieur Henry Dunant, entitled "*Un Souvenir de Solferino*," as well as to the personal exertions of that gentleman, that the movement which led to the International Congress of 1864 and its results was immediately due. Monsieur Dunant, a Swiss gentleman, was travelling in Italy on his own account in the year 1859, and was in the neighbourhood of Solferino on the day of the great battle of the 24th of June. The aspect of the battle-field, the sufferings of the vast numbers of wounded scattered over it, and the occurrences which he afterwards witnessed in the hospitals, where Monsieur Dunant remained for some days assisting as a volunteer in attending upon the wounded, excited in him the strongest mental emotions. Notwithstanding the able arrangements of Baron Larrey, the chief of the medical service in the field; notwithstanding the liberal provision which had been made by the administrative functionaries of the French army, in surgeons, in the means of transport, surgical stores, and sick dietary; notwithstanding, in addition, the aid afforded by some of the inhabitants of the places to which the wounded were first brought, M. Dunant saw that many of the wounded, owing to the vastness of their number, were left for some days without attention, and still longer without an adequate amount of nursing and surgical relief, and he was led to consider whether there were any means by which this superadded suffering in time of war might be obviated. Thus was formed the train of ideas which subsequently led to the publication of the "*Souvenir de Solferino*" in 1862.

The work may be regarded as consisting of two parts, although the diction is continuous; the first being a description of the incidents which Monsieur Dunant had observed in the battle-field and in the improvised hospitals at Castiglione, on the road to Brescia, and elsewhere; the second being a series of arguments in favour of a proposition for founding in every country permanent societies of persons willing to prepare themselves for supplementing the regular military establishments of surgical assistance in time of war—volunteers trained and organized before hand for carrying the wounded from the field, and for attending upon them afterwards in hospitals with requisite skill and care, under the direction of competent authority. Since it was on the field of battle, and in the crowded temporary hospitals in its immediate neighbourhood, that Monsieur Dunant had chiefly observed the want of sufficient assistance, it was in these situations that M. Dunant thought aid could most efficiently be given by devoted volunteers acting from motives of humanity and patriotism. I will notice presently how far such a system appears practicable to those who have considered the subject.

M. Dunant's work created a great sensation, and was quickly translated into several European languages. At the time of its publication there existed, and still exists, at Geneva a society called the Genevese Society of Public Utility (*La Société Genevoise d'Utilité Publique*), and this society appointed a committee, of which General Dufour, the Gene-



ral-in-chief of the Swiss Confederation, accepted the presidency, for the purpose of supporting and encouraging the dissemination of the proposals which had emanated from M. Dunant. The action of this committee subsequently led to the convocation of an International Conference on the subject. This was held at Geneva in October 1863, and was attended by delegates from sixteen Governments, viz., from Austria, Baden, Bavaria, Belgium, France, Great Britain, Hanover, Hesse-Darmstadt, Italy, Prussia, Russia, Saxony, Spain, Sweden, Switzerland, and Wurtemberg. This Congress, which must not be confounded with the subsequent Congress of 1864, sat four days, and discussed several articles which were laid before the assembled delegates for consideration by the Genevese Committee before named. Some of the propositions contained in these articles were assented to; others, especially those relating to the organization of corps of volunteer hospital attendants invested with independent action, were only accepted in part, and became considerably modified in the resolutions which the delegates finally agreed upon.

The delegates adopted and recommended a proposal that in every country central and sectional committees should be formed, for the purpose of supplementing in time of war, by every constitutional and practical means in their power, the regular hospital service of the army. But they did not support the articles in which propositions were contained for volunteer hospital attendants to be organized under engagements to serve during definite limited periods, with the right of being employed, according to their own desire, on duty in the field or in the hospitals. The articles proposed that these volunteers should wear a distinctive uniform; that their exclusively charitable character being recognized, their persons should be held sacred; and lastly, that following in the rear of armies, they should make no claims on the armies which they accompanied, but that they should take with them their own provision of means of transport, rations, and the material necessary for the exercise of their functions.

It was obvious enough to officers of military experience that these proposals, as they stood, would lead to interference with that unity and supremacy of control which is so essential for military discipline and success, even if they were not altogether impracticable, and they finally assumed at the hands of the assembly the following shape: that the National Committees, under whose direction the volunteer hospital attendants would be trained, should, in concurrence with the military authorities, designate the places where they were to attend upon the wounded; that on the demand, or with the permission of the military authorities, the National Committees might send volunteers into the field on the understanding that, while there, they were to be placed exclusively under the order of the Commander of the Forces for duty. So far, then, as regards the manner in which the propositions which were submitted to this Conference of 1863 were dealt with; in addition, however, before separating, the delegates recorded by general vote a strong appeal to the Governments of all civilized nations to come to an agreement for according the benefits of neutrality to all soldiers of regular armies, whatever nation they might belong to, who



had the misfortune to be placed *hors de combat* by wounds or sickness in time of war, as well as to the hospitals receiving them, the hospital staff and attendants, and to any of the inhabitants at the seat of war who might give them assistance; that a common recognizable sign should be adopted to indicate the medical staff of all armies; and that a common flag should be adopted in every country to designate the military hospitals.

Two actions followed the resolutions of the International Assembly of 1863. One of these was the formation of National Committees in various countries; among others, in Austria, Prussia, and Denmark, where the committees were soon called upon to discharge their functions practically in the war which shortly afterwards occurred in Schleswig-Holstein. The second was a course of proceeding which ultimately led to the International Congress of 1864, for the purpose of considering the question of the neutralization of the sick and wounded soldiers of belligerent armies. This is the Congress from which the Convention emanated which we shall have to consider presently.

This Congress was assembled in accordance with a request from the Supreme Federal Council of Switzerland. The Geneva Committee which I have before mentioned, and to which the designation of "International Committee" had been given at the Conference of 1863, having ascertained that fifteen of the Cabinets of Europe were favourable to the adoption of a treaty for the neutralization of sick and wounded soldiers in time of war, as well as of the *personnel* employed in attending upon them, solicited the Swiss Government to invite the other Governments to take part in a General Congress for discussing and agreeing upon terms on which a convention on the subject might be based. The Federal Council acceded to the request, and proposed Geneva as the place of meeting, and the 8th of August as the time for opening the Congress. It was felt that Switzerland, with no permanent army of its own, and placed as a nation in an independent position, as it were, with regard to the conflicting interests of the great European powers, might initiate such a movement with grace and propriety.

The invitation was accepted by sixteen powers, and the Congress was opened, on the date before named, in a portion of the Hôtel de Ville at Geneva, which was furnished for the occasion by the Federal Government. The representatives, twenty-five in number, consisted of members of the diplomatic service, as well as officers of the military and medical staff of various armies. The deliberations lasted nearly a fortnight, and the terms were finally agreed upon for the Convention which was signed on the 22nd day of August by the representatives of twelve Governments who had accredited their delegates with sufficient powers for signing a treaty. Subsequently it was adhered to by four others, including our own Government. The accession of the British Government to the Convention was signed at London on the 18th of February, 1865.

The Governments which have acceded to the Convention, in addition to the Government of England, are those of France, Prussia, Spain, Portugal, Holland, Belgium, Italy, Switzerland, Greece, Denmark,



Sweden and Norway, Mecklenburgh-Schwerin, Baden, Wurtemberg, and Hesse-Darmstadt.

This is a remarkable instance of a general treaty brought about by the exertions of an individual in private life; at the same time, without the active support and operations of the International Committee of Geneva, but, above all, without an advanced philanthropy inducing a strong general desire for lessening as much as practicable the evils of war to individual soldiers, who, after all, have no personal feelings in the conflicts in which they are engaged, who only act as instruments; without these aids, it is more than probable that the benevolent efforts of Monsieur Dunant would never have achieved the work they at last accomplished.

I have thus rapidly glanced at the history of the circumstances which led to the International Congress of 1864. I have now to give some account of the several articles of the Convention which resulted from it.

It is important to understand that the particular aim of this Congress was to obtain the neutralization of wounded of belligerent armies and of the *personnel* and *matériel* which are necessary for their care and treatment. Hitherto it has not been the custom of war to regard soldiers disabled by wounds, any more than the surgeons or others in attendance upon them who might fall into the hands of an enemy, as neutrals. As already noticed, in a few exceptional instances, from motives of generosity or by special agreement between hostile generals, both wounded soldiers and military surgeons have been so regarded; but the general custom has been to regard them as prisoners of war, and, like all other prisoners, only to be given up on the principle of exchange. Equally all hospital and ambulance transport equipment or materials falling into the hands of the enemy were regarded as prize of war. The Congress of 1864 was solely to determine whether the humane principles which had now and then been applied exceptionally, might not, under certain limitations, be rendered consistent with military necessities on all occasions, and be established as a rule.

As to the question of a common flag, if the sick and wounded were to be treated as neutrals by belligerents, and if the military hospitals, attendants, ambulance transport, and the surgical materials necessary for the wounded were to be included in the protection accorded to the wounded themselves, it would naturally follow that a common flag, or some other recognisable sign, would be necessary to indicate them, so as to secure the protection they were entitled to.

I have dwelt upon the special purpose of this Congress, because it was supposed by some persons that the question of independent volunteer attendants, which had been discussed, as I have already mentioned, in the former assembly of 1863, was again to be opened and discussed in the Congress of 1864. This erroneous supposition led to the Congress being regarded with suspicion, and even with positive disapprobation, by some who would doubtless have regarded it very differently had no such views been entertained by



them. But it was only on a positive understanding that this question was not to be re-opened, and with a pre-determined resolution not to join in any treaty which included the admission of *independent* volunteers, that some of the delegates were sent by their respective Governments to the Congress. On examination of the articles of the Convention it may be noticed that all allusion to volunteers has been rigorously excluded from the treaty. In case of volunteer corps of hospital attendants being organized, there are other fields open for the exercise of their patriotic and charitable functions besides those with the armies operating in the field, where endless difficulties might arise from their independent presence under the ordinary circumstances of campaigning. Should their services be required in the field by the supreme military authority, they would doubtless only be accepted on the condition of the men of the corps becoming incorporated and forming for the time, part of the military establishment, and of their being subject to all the rules and articles of war; and then they would fall under the benefits of the treaty, because they would be comprised in the *personnel* of the hospitals under the second article.

The articles in which the terms of the Convention are embodied are nine in number, and the following is a copy of them in the translated form in which they were presented when the accession of the British Government to the treaty, was laid before Parliament.

"Articles of the Convention, signed at Geneva, August 22nd, 1864, for the amelioration of the condition of the Wounded in Armies in the field, and acceded to by the British Government on the 18th February, 1865.

#### Article 1.

"Ambulances and military hospitals shall be acknowledged to be neuter, and, as such, shall be protected and respected by belligerents so long as any sick or wounded may be therein.

"Such neutrality shall cease if the ambulances or hospitals should be held by a military force."

#### Article 2.

"Persons employed in hospitals and ambulances, comprising the staff for superintendence, medical service, administration, transport of wounded, as well as chaplains, shall participate in the benefit of neutrality whilst so employed, and so long as there remain any wounded to bring in, or to succour."

#### Article 3.

"The persons designated in the preceding Article may, even after occupation by the enemy, continue to fulfil their duties in

The original articles being in French -



the hospital or ambulance which they serve, or may withdraw, in order to rejoin the corps to which they belong.

"Under such circumstances when those persons shall cease from their functions they shall be delivered by the occupying army to the outposts of the enemy."

#### Article 4.

"As the equipment of military hospitals remains subject to the laws of war, persons attached to such hospitals cannot, in withdrawing, carry away any articles but such as are their private property.

"Under the same circumstances an ambulance shall, on the contrary, retain its equipment."

#### Article 5.

"Inhabitants of the country who may bring help to the wounded shall be respected, and shall remain free. The generals of the belligerent powers shall make it their care to inform the inhabitants of the appeal addressed to their humanity, and of the neutrality which will be the consequence of it.

"Any wounded man entertained and taken care of in a house shall be considered as a protection thereto. Any inhabitant who shall have entertained wounded men in his house, shall be exempted from the quartering of troops, as well as from a part of the contributions of war which may be imposed."

#### Article 6.

"Wounded or sick soldiers shall be entertained and taken care of, to whatever nation they may belong.

"Commanders-in-chief shall have the power to deliver immediately, to the outposts of the enemy, soldiers who have been wounded in an engagement, when circumstances permit this to be done, and with the consent of both parties.

"Those who are recognized, after they are healed, as incapable of serving, shall be sent back to their country.

"The others may also be sent back on condition of not again bearing arms during continuance of the war.

"Evacuations, together with the persons under whose directions they take place, shall be protected by an absolute neutrality."

#### Article 7.

"A distinctive and uniform flag shall be adopted for hospitals, ambulances, and evacuations. It must, on every occasion, be accompanied by the national flag. An arm-badge (*brassard*) shall also be allowed for individuals neutralized, but the delivery thereof shall be left to military authority. ✓



"The flag and arm-badge shall bear a red cross on a white ground."

*Article 8.*

"The details of execution of the present Convention shall be regulated by the Commanders-in-chief of belligerent armies, according to the instructions of their respective Governments, and in conformity with the general principles laid down in this Convention."

*Article 9.*

"The high contracting powers have agreed to communicate the present convention to those Governments which have not found it convenient to send plenipotentiaries to the International Conference at Geneva, with an invitation to accede thereto; the protocol is for that purpose left open."

I will now consider these articles separately.

The first article naturally provided for the security of the hospitals in which the wounded might happen to be collected. Military hospitals, both those in the field and those of a more permanent kind in rear, were to be recognized as neutral points, and to be safe from attack or disturbance. But as these hospitals were only to be respected for the sake of the wounded contained in them, it became necessary to stipulate that the presence in them of these sick or wounded was essential for ensuring a title to this consideration. Hospitals and their contents, when unoccupied by patients, would naturally fall under the ordinary rules of war, just as any other buildings or *matériel*. It became also evident, on discussion, that the stipulated immunity from attack of a hospital might, in certain situations and under certain circumstances, be abused, and it was necessary to provide against such an abuse. A mortar battery might be so placed in rear of a hospital as to be incapable of attack so long as the hospital itself had to be respected; or the hospital might be placed in a position of strategical importance, with a military force holding the position, under pretence of guarding the hospital. The restriction that the neutrality would cease if the hospital was held by a military force became therefore necessary. Of course a simple guard, for the maintenance of military order and discipline, was not intended to be included in this restriction.

Military hospitals, with certain reservation, being thus recognized as neutral, it next became necessary to define the *personnel* who were to be included in the benefits of this neutrality, and to lay down any restrictions necessary for ensuring that the neutrality should only be applied to the purposes for which it was admitted. In the first place, the neutrality of the hospital *personnel* was only agreed upon in the interest of the wounded, not for the individual benefit of the persons comprising the *personnel*; and, in the second place, the interests of every army at large would require that steps should be taken to guard against persons moving among its ranks, and perhaps abusing the opportunity of



observation thus afforded under cover of neutrality. With these ends in view, the second and third articles of the treaty were framed. In defining the *personnel*, all the classes of persons usually comprised in the official organization of military hospitals were included, not only the medical officers and their subordinates, but those also in whom the functions of general superintendence, administration of supplies, and transportation of wounded were vested; in short, all the official hospital establishments. To none of them, however, was accorded the neutrality, excepting so long as the sick and wounded needed their services. They might remain on duty with the wounded of the forces to which they were attached with impunity, even after the conquering army had gained possession of the ground on which those wounded were—a great boon under circumstances where the conquered might happen to speak a different language from the conquerors, or when the latter had limited means of surgical attendance at their disposal. When no wounded remained to require their services, the neutralized persons would be permitted to rejoin the forces to which they belonged, and their neutrality would only cover them from the hospital up to their arrival at the advanced posts of these forces, to which they would be conducted under the charge of the army occupying the position from which they retired. These limitations obviated the risk of persons included in the second article abusing their neutrality for purposes of spying or idling.

The fourth article settles the terms on which the *materiel* of ambulances and hospitals is to be regarded under the treaty. By the first article, ambulances and military hospitals being only neutralized while containing sick or wounded, they and their contents would, by the laws of war, become the property of the conquering force when no sick or wounded remained in them. No reason for altering this was advanced so far as regards the fixed hospitals, but many reasons were found for mutually agreeing that this right of the conqueror should not be exercised so far as regarded the ambulances, or moving field hospitals. Take away the *materiel* from these—the stretchers and other articles of field transport, the means of dressing the wounded, the restoratives, the appliances for lessening the evils of transportation, and such things—and you deprive the soldiers who may be afterwards wounded, of their first means of safety, and add greatly to their sufferings. Moreover, while the stores and furniture of stationary hospitals are often collected in abundance as reserves, and are costly, those of the ambulances are necessarily limited, and of little money value as prize of war to the captors. The *materiel* of the ambulances was therefore neutralized, while only the private property of the *personnel* employed in the fixed hospitals was protected by this article.

The best plan for securing another important means of succouring the wounded, especially after great battles, was a subject of much consideration. This was to secure the aid of the civil inhabitants of the towns and villages adjoining the site of the action, an object frequently found very difficult to attain. It was felt to be of the utmost importance to adopt measures for dissipating the alarm which so frequently causes these persons to flee from the neighbourhood, and



for obtaining their services as early as possible after the conflict. At such a time the victorious army has generally to occupy itself not only with its own injured and dead, but also with numbers of the enemy, not to mention various other duties which devolve on it, and this is the very time when speedy removal from the scene of conflict and immediate attention, is of vital importance to the wounded. Hence the fifth article was introduced, by which not only protection was promised to inhabitants assisting the wounded, but a dispensation from the quartering of troops and other advantages were agreed upon for those who received the wounded and attended upon them in their houses.

The sixth article binds the contracting parties to the treaty not only to give requisite care and treatment to all sick or wounded who may fall into their hands, but also enforces the important principle that the misfortunes of those who are disabled by the effects of their wounds are not to be aggravated by the many depressing influences which are entailed by banishment and loss of liberty:—they are not to be retained as prisoners of war. If circumstances admit, and mutual consent is given, the wounded may be given up at once, immediately after an action, to be cared for by their own army. Otherwise, if they are retained, and, after proper treatment, are found to be disabled for service, they are by the treaty to be sent back to their own country and friends. It is left optional, as regards the wounded who recover completely from the effects of their injuries, for the contracting parties to determine whether they shall be sent back to their own country on condition of not serving again during the war, or whether this liberty shall not be granted. It was necessary to add a paragraph to this article to protect with neutrality not only the wounded or disabled soldiers while being convoyed to their destination, but those also who are engaged in the duty of directing the sick convoy.

To enable the neutralization of the ambulances, hospitals, ambulance transport, and their *personnel* to be effectually carried out, it was necessary, as I have before mentioned, to fix upon a common sign by which they might be recognized by all parties joining in the treaty. A flag was obviously the most convenient for the hospitals, both moving and fixed, and for sick convoys; but, for distinguishing the *personnel*, a *brassard*, or arm-badge, that could be readily worn over a coat sleeve, was fixed upon as the most convenient. The design proposed was a red cross, *alézée*, upon a white ground, and being simple, and, moreover, typical of the Christian principle of international charity embodied in the Convention, it was unanimously adopted. There was also a propriety in adopting this design, for the colours being changed it was the national flag of the country in which the Congress was then sitting, and to which,—a neutral country itself as it were in the midst of the Great Powers of Europe,—was due all the credit of the effort which was then being made to lessen the rigours of war by neutralizing its chief sufferers. But in adopting this flag and common sign two things were necessary. Firstly, it was necessary to indicate not only the objects and persons having a right by treaty to



be shielded by neutrality, but also to show to what country they belonged; the national flag was therefore required to accompany the neutral flag whenever the latter was used. Secondly, it was necessary to guard against any one assuming the use of the *brassard* who had no official title to it; therefore it was left to the military authorities to issue the *brassards* so that the right persons only should have them. To the Generals-in-chief of the belligerent armies was also left by Article 8 the execution of the treaty in all other particulars under the instructions of their respective Governments; the object being to guard against any such rigid fulfilment of its terms being exacted as might on any occasion interfere with the general military interests, which, of course, must always be recognized as overriding the interests of the wounded, and all other interests in time of war.

The ninth article provided for the treaty being left open for the subsequent admission of other Governments. A tenth article was included in the Convention, but this simply related to the formal arrangements for its ratification.

I have thus passed rapidly in review the terms embodied in the several articles of the Geneva Convention of 1864, and brought to notice the points which formed the chief subjects of discussion at the meetings of the Congress in reference to them. The treaty will materially lessen the misfortunes of those officers and soldiers who happen to be disabled by wounds or sickness in time of war, for it establishes their neutrality and the neutralization of all that is essential to their preservation and restoration to their country and friends; and it does this without in any way interfering with the military interests of the belligerents. Its execution has been mutually agreed upon by a formal compact between the Governments of sixteen countries and states, including all the great powers of Europe, with the exception of Austria and Russia, and, as the treaty is still open to them, it is to be hoped that, although they have not yet joined it, they will eventually do so, and that the principles of justice and humanity embodied in it, will become an established law among all the civilised nations of the world. The anxious consideration that was given to the articles of the treaty not only by the delegates of such military nations as France and Prussia, but also by the higher military authorities in those countries (for constant communication was kept up with the central authorities during the sitting of the Congress) is calculated to remove any doubts as to the practicability of carrying out the terms of the treaty. But the practical nature of the compact is proved beyond doubt by the fact, that on certain occasions, as I have before remarked, to the honour of those concerned, the very provisions embodied in the treaty have been carried into practice by mutual special agreement. An historical account of these occasions was printed and laid before the Congress by the International Committee at Geneva, and a notice of the principal among them may be found in the last edition of a little work entitled "*La Charité Internationale sur les Champs de Bataille*," which was published in Paris last year.

I have now to make a few remarks on the National Committees.



I have before mentioned that the International Conference of 1863, in addition to paving the way for the Congress of 1864, led to the establishment of National Committees in certain countries for assisting wounded soldiers in time of war, but I have not yet mentioned any particulars concerning these Committees. The general principles on which these Committees are formed were set forth by the Geneva Conference of 1863 in a series of ten resolutions. They may be summed up as follows. Each Central Committee is to organize itself, and to form sub-committees and sections, in the manner most suitable to the circumstances of the country in which it is placed, and to establish relations with the Government so that its offers of service may be acceptable when need of them shall arise. In time of peace, the Committee is to collect information on the best means of affording aid to the Government in case of war; to make itself acquainted with all improvements in the means of helping wounded soldiers; to employ itself in forming and training volunteers for service in hospitals approved by the authorities; to make a collection of the materials most necessary for sick and wounded; and, in short, to study all matters that may conduce to the great object of ameliorating their condition in time of war. Friendly relations are to be kept up between the National Committees of different nations, so that any improvements in field transport, or inventions likely to be serviceable to sick and wounded in campaigning, made in one country, may be made known in other countries, just as improvements in the implements of destruction are mutually observed, and generally without much reserve communicated, between nations on friendly terms with each other. In time of war, the Central Committees of the belligerent nations are to become the agents of the public at large for affording aid through the proper authorities to the sick and wounded of the respective armies, and, if required to do so, but only if so required, are to place at the disposal of the military authorities volunteer assistants for service in hospitals, or even for carrying or otherwise helping the wounded in the field of action itself.

Committees based on these principles have now been formed in nearly all the chief capitals of Europe. These Committees present the names of military and civil persons distinguished by their official rank or social standing, and are generally under the patronage of members of royal families. In France, the Emperor has himself given marked encouragement to the undertaking, and the Central Committee in Paris has been constituted with the Minister of War as honorary president, and a General of Division as president. No Committee has as yet been formed in England, and I will presently mention some circumstances which lead me to think this a subject for regret.

Before stating them, however, I may mention that some of the National Committees formed since the Congress of 1863 have had the opportunity of practically exhibiting their usefulness in time of war. The campaign of Schleswig-Holstein in 1864 gave opportunities to the Central and Sectional Committees in Prussia, Austria, and Denmark of supplementing with advantage the official means of hospital assistance. The Central Committee at Berlin organized and furnished



volunteer assistance, both in *materiel* and *personnel*. An appeal was made for surgical aid, and it was answered by sixty-eight young civil surgeons being sent to help in the hospitals at the seat of war, with the consent of the military authorities. In Copenhagen and Vienna, the Central Committees equally collected funds and assistance of all kinds for the sick and wounded, and organized a systematic distribution of them.

Doubtless there will not be less interest shewn as regards the troops of this country, should they become engaged in active hostilities of an extended nature, than has been exhibited in the more important wars of recent years; and there can be no one among us who is not familiar with the volunteer philanthropy of this nation, its liberality, and the examples of personal devotion that were so conspicuous during the Crimean campaign and the Indian mutiny. Indeed, in case of such a calamity occurring—I say calamity, for even when war is waged on the justest principles, for the protection of the weak, for the maintenance of national honour and independence, it is still acknowledged by all thoughtful persons to be one of the greatest calamities that can befall a nation—in such a case it seems likely that public interest will be even more strongly expressed than it was on the occasions to which I have referred, especially if the war in which our army be engaged should take place in Europe or in America. Some of the circumstances which I named at the commencement of my remarks as being so favourable for the convocation of the Geneva Congress of 1864; the strong hold and great influence which humanitarian doctrines have attained as one result of the spread of civilization; the great activity of thought among people at large; the rapid communication of intelligence to great centres almost irrespective of distance, and its immediate circulation through whole communities; the facilities for personal movement and observation by land and sea; all these are daily on the increase, and this increase will still further tend to ensure the maintenance of continued watchfulness, not only over the army as a body, but also over the personal concerns, the health, and the welfare of all the individuals composing it. While the loss of life resulting from the direct effects of a battle must ever be regarded as one of the inevitable results of war, unnecessary loss of life from deficient means of transport for the wounded, deficient surgical aid, deficiency of needful supplies on the field of action, will be closely scrutinized. The wounded officers and soldiers will be watched from the place of fighting to the hospitals, and anxious attention will be given that in no way that can be avoided by care or expenditure of means, shall loss of life occur, or health suffer, while they are engaged in the active service of their country.

The best organization for meeting the urgent medical and surgical demands which would arise in time of war in the British army, has been most carefully studied. It would be out of place for me to refer here to the details of the plan on which the military medical arrangements have been approved by the Government of this country to be worked in time of war; suffice it for me to say that I believe the system to be as admirably contrived and as capable of expansion in



case of need as that of the medical department of any army in the world. But even if the approved plan of assistance for the sick and wounded should be thoroughly carried into execution, and should be practically applied, as regards the provision of *materiel* and *personnel*, in the same liberal spirit as was contemplated by those who designed it, this provision, liberal and well organized and well prepared as it would then be, would still require to be supplemented by popular aid in case of a great battle or a prolonged campaign. No Government in the world could afford to maintain a medical staff, or to provide the necessary means of meeting the wants of such a battle as that of Solferino, in the way that the wants of the wounded are now expected to be cared for. The *percentage* of wounded is stated to have been less at Solferino than it has been in any other great battle for many years past; but still the vast number of wounded which were thrown upon the care of the allies after that battle—about 20,000—not to mention the sick requiring care at the same time: the great extent of ground over which they were scattered: the rapidity with which the troops had been concentrated, defeating all the efforts for bringing up at the same time many necessary surgical stores: these created demands that no Government establishment alone could have possibly supplied. The treaty of 1864 will facilitate to some extent the meeting of such emergencies in future, for a proportion of the surgeons and medical staff of the conquered can be left behind with their wounded without fear of being retained as prisoners of war; and the wounded themselves, as soon as they are fit to move, can be restored to their own countrymen for care and treatment, and the charge that will fall upon the conquerors will be thus proportionably lessened.

There are two directions in which, in such general engagements, deficiencies are liable to be experienced. One is in the number of the executive—the surgeons, and the hospital attendants upon whom so much depends, men trained for properly carrying the wounded, and for attending upon them under the directions of the surgeons;—the other is in the means of transport, and in hospital stores. One of the proposals, as I have before mentioned, at the International Conference of 1863, was that independent volunteer aid in both these respects should be afforded on the field itself. I have already said that this proposal cannot be held to be generally practicable. To be ready to give help at any moment, such a volunteer establishment must move with the army; and the rationing of the men and of the transport animals composing the establishment and its movements by independent means in time of war, as proposed, could not be carried out. But is this volunteer assistance, therefore, inadmissible in every way? This by no means follows as a matter of course, and here one of the useful qualities of the National Committees might show itself. On the same principle as in time of war, a portion of the home defence would be left to volunteer combatants, while militia regiments would be moved to take the place of regular troops in colonial garrisons, and the regular troops be thus set free for work in the field, so it seems feasible that under the direction of the National Committees, and with the concurrence of the Government, volunteer hospital corps could be utilised in time of war.



The men of the army hospital corps, under ordinary circumstances required for performing the duties of the home and of the intermediate hospitals which the necessities of war require to be established (and which will probably be greatly increased in numbers in future, from the now proved importance of distributing the sick and wounded over a wide area in small hospitals to prevent army epidemic diseases, instead of crowding them together in single towns or large buildings), this regular corps might in the same way be rendered available for duty in the field hospitals, their places in the former being taken by the volunteer assistants. But this plan, to answer, must be regularly organized on a definite system, in communication with the Government, and this would be the work of the Central National Committee. There would be no reason why volunteer hospital attendants, after sufficient experience, and with proper organization, should not be drafted to serve in the field to meet necessities that might exist there, on demand and under appropriate regulations. Emergencies might arise in which, due regard being given to the just interests of the regular and permanent establishments, very valuable and material aid might be given by such means to the military authorities and the Government, as well as benefit conferred on the sick and wounded of the army. So with material aid. During the Crimean campaign vast supplies were collected in England from hundreds of independent sources, but from want of system, a large proportion of the supplies, valuable as they were in themselves, were rendered useless from being inappropriate in kind, or from arriving when they were no longer required. In all recent wars, every Government has received aid from the nation towards supplying the wants of those injured in the nation's cause. At the opening of the Italian campaign in 1859, a *depôt* was opened in Paris for the reception of old linen for the manufacture of *charpie*, and in a few days some tons were presented, and other donations from the nation, for the sick and wounded of the French army rapidly followed. In Austria, from the number of sick and wounded sent out of Italy, shown by official returns to be not less than 48,713 men, we are told "public sympathy and interest was largely aroused; hospitals were "opened in many remote places; the Empress formed one at Laxenberg; "others were opened at Hetzendorf, Trieste, near Vienna, and many "other places; ladies of the highest rank attended in these hospitals; "and patriotic societies everywhere arose who forwarded stores, food, "and money. The telegraph was of the most essential service in "rendering the distribution of the sick possible." I need do no more than allude to the wonderful work of the Sanitary Commission organised in the United States of America during the late civil war, for that has already been ably described by Mr. Fisher in a recent lecture in this theatre. I may remark, however, that I do not think any one can study the work of that vast association without coming to the conclusion that the beneficial influence it exerted as regards the armies of the United States was beyond calculation. With all the wonderful energy, the vast expenditure of treasure, the immense surgical resources, which the United States' Government brought to bear for the relief of the sick and wounded of their armies, and the able



administration of the medical bureau at Washington, these means, without the aid afforded by the Sanitary Commission, would have been very far short of what was necessary for preserving the health of the troops in the degree in which it was preserved after that national association was in full operation, and without this preservation of health most important advantages must have been lost, and the war probably greatly prolonged. I have already alluded to what has been done by some of the National Committees since their establishment in 1864, and need not again refer to them. If a similar National Committee were established in England, one of its functions would be to organize the distribution of the national donations and aid on a proper footing. Should this country remain without the formation of such a committee, it will find itself at a disadvantage, as compared with neighbouring countries, in case of becoming engaged in a great war. Committees no doubt will be formed and subscriptions poured in as has happened hitherto, as soon as there is need of them; but, as heretofore, there will be absence of system and independence of action, and there will not be the advantage, at any rate at first, of Government support; while, in other countries, on war breaking out, the necessary preparations will have been long made and fully considered, everything will be systematised on preconceived plans, so as to harmonise with the arrangements of the Government and the action of the combatant and army medical authorities. These are some of the reasons which induce me to hope that this country may yet have its National Committee on the same footing as the National Committees on the Continent.

In conclusion, I would observe that I have purposely avoided any attempt at exciting feelings in favour of the Convention of 1864, and of the formation of a National Committee in this country, by attempting to draw a picture of the sad collateral events which spring from war, or of the sufferings of those who in the course of duty fall wounded on the field of action, and become inmates of our military hospitals. Those who have been witnesses of fields of battle and the occurrences which follow in the ambulances and hospitals, need no description to induce them to attempt to mitigate, as far as practicable, the sufferings which are undergone in these situations; and to those who have not witnessed these scenes, any description from me would convey very inadequate ideas concerning them. Neither have I attempted to bring to notice the names of those who have already stood prominently forward in trying to lessen these evils; they are recorded elsewhere. I have attempted simply to carry out the plan I laid down at starting, viz., to give a plain narration of the circumstances which led to the International Congress of 1864, to lay before you a brief exposition of the articles of the treaty which resulted from it, and to give some account of the National Committees which have been formed in various countries for aiding in ameliorating the condition of sick and wounded soldiers in time of war, as well as to suggest some reasons for the formation of a National Committee with the same objects in view in this country. It appeared to me that I should thus best fulfil the task I had undertaken at the request of the Council of this Institution.



The CHAIRMAN: We are extremely indebted to Professor Longmore for the very interesting address which he has been so good as to give us on this most important subject. He has traced the history of this movement and work, and he has shown us with what good judgment and good sense, and in how practical a manner, it has been carried on all through. He has observed that which I think must be patent to all of us, that when such efforts are made for the perfecting of those instruments of warfare by which human life is destroyed, it is also natural and right that those who are influenced by feelings of humanity, should employ their best exertions to endeavour to preserve human life, and to lessen as far as possible the miseries and horrors of war. I believe no better means could be devised than those which have been suggested, and which were described by Professor Longmore for the formation of these National Committees. I am myself acquainted with M. Dunant. I know how highly he is respected in his own country; I know how he was occupied before he devoted himself to this subject; and I know that his efforts have always been directed to the improvement of the condition of his fellow-countrymen, and to the promotion of every humane, religious, and civilising object. It appears to me that if this Committee can be carried out, in case we engage in it, it may have the effect of enabling us not only to mitigate the horrors of war in themselves, but really to form connections with those who may influence the various Governments of Europe to abstain from war, and to encourage rather the arts of peace. Wars may be necessary, as Professor Longmore has said, for the vindication of a nation's honour, and for the defence of one's own country; but the more public opinion can be brought to bear upon the Governments at whose instance wars are undertaken, the more benefit will accrue to nations at large. Professor Longmore has well said that the soldiers, who are the individual sufferers in war, are not those for whose interests wars are made. Professor Longmore very wisely abstained from harrowing our feelings with descriptions of what takes place in war; but there are a few words in one of these newspapers which have been sent to me, which I will venture to read to you. It is in the *Journal de Genève*, of February, 1864:—

“Rappelons aussi qu'à Flensbourg il y a peu de jours, faute d'une organisation créée d'avance et de comités bien constitués, les malheureux blessés n'ont pas été relevés, et que gisant ensanglantés dans les rues de cette ville les roues des chariots de l'artillerie leur ont passé sur le corps.”

It really does convey an impression of the great want of medical and surgical assistance in the time of war, that the poor creatures who had been fighting for their country were lying in the streets, and by a military necessity, artillery, being called to fire on the enemy, these poor creatures were absolutely destroyed by their own artillery passing over them. Now, if such a corps existed as Professor Longmore has suggested, a corps of volunteer assistants in time of war, the wounded might have been moved away, and most likely they would have been transported from the place of danger, and



received such assistance as could have been given them. There is one subject on which I feel extremely anxious myself in regard to what has been brought before us; that is, that if we take a part in this international work, our own Government should not consider themselves in the least degree freed from the responsibility which in my opinion attaches to every Government, that of taking care of the sick and wounded in time of war. I believe it is true that no Government can be prepared beforehand for all circumstances that are likely to take place, in case we are engaged in a future war. It would, indeed, be a matter of great regret, and a great misfortune, if any Government should think itself liberated from its own first and most imperative duty, and I rejoice much to know that in the international exposition which is to take place in France in the course of the year 1867, a special department will be organized in this most humane and admirable cause, and that persons will be invited to exhibit any machines or instruments, or means of providing for the care of the sick and wounded in time of war, and that every facility will be given to afford information upon this most interesting and important subject. I see also that the Prussian National Committee has offered a very handsome prize for suggestions upon this subject, and I hope some papers will be sent from this country. But the practical object which, I understand, Professor Longmore desires to bring before us, is rather that we in this country should establish a Committee to co-operate with our own Government, and I suppose also with foreign Governments, for the promotion of this work. And if the lecture which Professor Longmore has given, should lead us to form such a Committee, I am sure we shall all rejoice in that which may relieve the distresses of war, and which may, under Divine Providence, have even the effect of preventing war.

General Sir WILLIAM J. CODRINGTON, G.C.B.: There is one point upon which I desire to ask a question. Every person must be gratified with the intelligence with which Professor Longmore has characterised his lecture. I think I heard him mention that no country would go into war better prepared for the succour of the wounded than our own. It would be interesting to know what those preparations actually are for the care and removal of the wounded from the field to the field hospital, and from the field hospital to the more permanent hospital in the rear.

Professor LONGMORE: In reply to the question, I would beg to say that the arrangements which have been made by our own Government, including those for the care of the wounded on the field of action itself, as well as others, for the transportation of the wounded from the field to the ambulances, or field hospitals, and, thence, to the hospitals in rear, are now defined in the authorized army medical regulations. I consider that these arrangements have been made on as liberal a scale as those which exist in any European country.

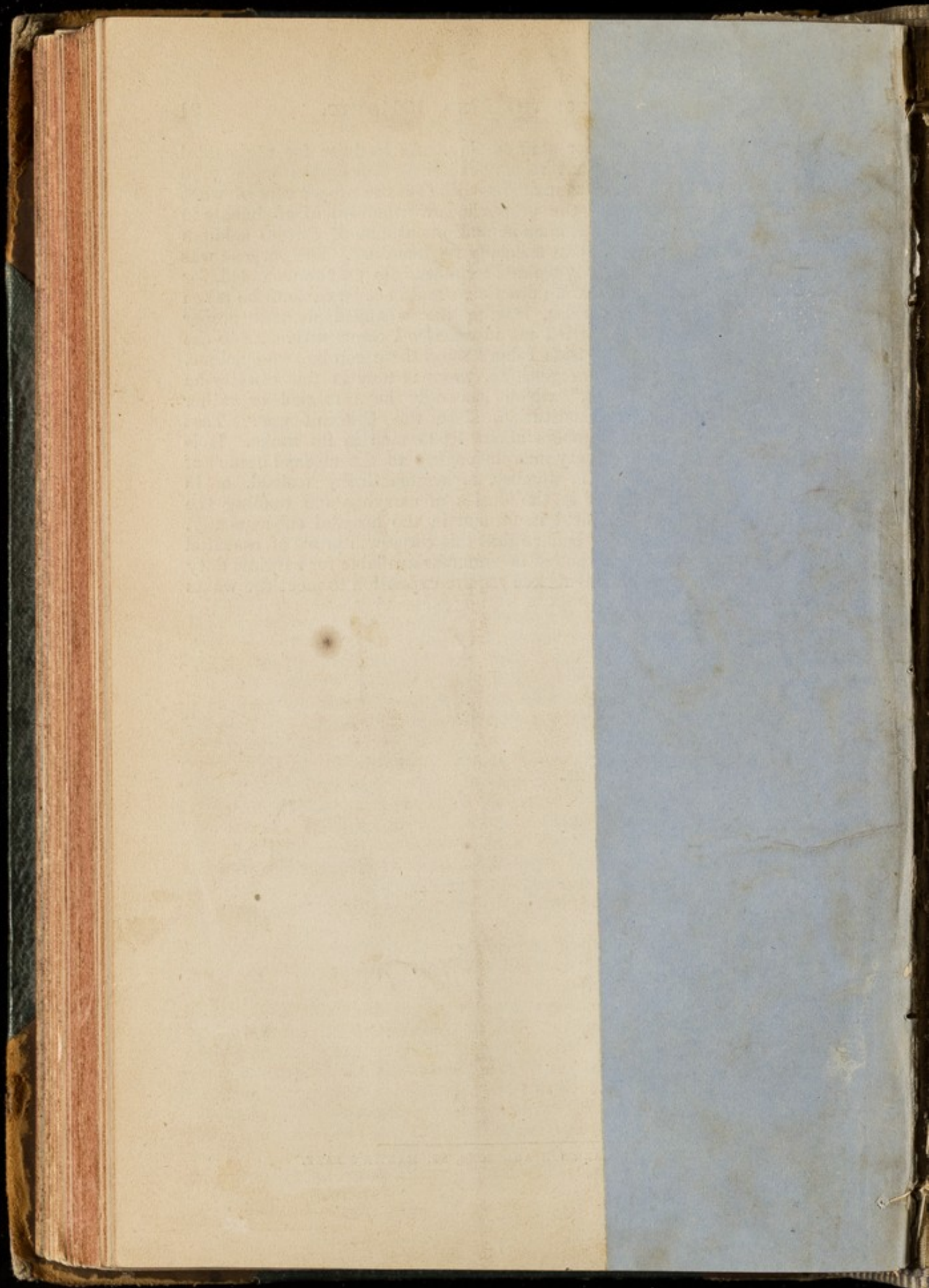
General CODRINGTON: I only want to know what is the actual preparation? Are there men told off for the purpose? I want to come to the practical part of it.

Professor LONGMORE: As regards the men, I can only practically



speaking of those told off for staff employ. As to those for regimental service, I only know that recommendations have been made, and orders have been issued to make provision for the proper care of what may be expected to be the proportion of wounded of regiments in action by the previous instruction and preparation of certain soldiers in those regiments, set apart specially for this duty. The purpose was that these men, being only trained for attending on the wounded, for hospital work, and not in rifle practice, should not be liable to be taken away for fighting purposes, leaving the wounded without proper relief; how far this is carried out in practice I cannot say. As to the necessity for such a provision I don't think there can be two opinions. As regards the staff arrangements, there is now in this country an "Army Hospital Corps," which has only been formed or rather received its present constitution, since the Crimean war. That Hospital Corps now numbers about 1,000 men in its ranks. It is regularly organised. Every man belonging to the medical branch of the corps, nearly 500 in number, is systematically trained, or in course of being trained, in the duties of carrying and tending the wounded, both on the field itself, and in the hospital subsequently. There is every reason to believe that this corps will prove of essential service in time of war; though the number available for surgical duty being so limited, it will doubtless require expansion to meet the wants of a campaign.







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A LECTURE DELIVERED AT THE ROYAL UNITED SERVICE INSTITUTION.

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*(Authors alone are responsible for the contents of their respective Memoirs.)*



*(For private circulation only.)*

## LECTURE.

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Friday, April 12th, 1872.

COLONEL THE HON. CHARLES H. LINDSAY, M.P., in the Chair.

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ON THE GENEVA CONVENTION OF 1864, IN RELATION TO THE AID AFFORDED BY VOLUNTEER SOCIETIES TO SICK AND WOUNDED SOLDIERS DURING THE LATE FRANCO-GERMAN WAR, WITH A GLANCE AT THE PROPER FUNCTIONS OF NATIONAL AID-SOCIETIES, PARTICULARLY THE BRITISH AID-SOCIETY, IN THE FUTURE.

By Deputy Inspector-General T. LONGMORE, C.B., Professor of Military Surgery at the Army Medical School, Netley; and delivered, in his unavoidable absence, by Deputy Inspector-General MACLEAN, C.B.

THE origin of my having the honour of addressing you to-day was an accidental conversation with Captain Burgess, the excellent Secretary of this Institution, during our autumn holiday last year in Dorsetshire. Some remarks which I then made to him respecting a prevalent misapprehension of the terms of the Geneva Convention, led him to suggest that it might be of use were I to make them more widely known through an address in this theatre. I did not at that time consider the matter one of sufficient importance to occupy the time of an audience at the Royal United Service Institution, more especially as I had already attempted to explain the Articles of the Convention shortly after the Treaty was concluded; but circumstances have since changed my impressions on this point, and it now appears to me, and it has appeared to some others, including the Director-General of the Army Medical Department, that a few public remarks on the subject may probably lead to some good. I myself have been led to this conclusion from observing in various articles in the newspaper press, but more particularly in the published replies to a series of questions issued by the British National Society for Aid to the Sick and Wounded in War, sentiments very generally expressed concerning the Geneva Convention of 1864, the intended modes of applying its Articles, and the immunities and privileges agreed to be conferred by it, such as, I am well aware, were never held by those who framed the Convention, and which, indeed, cannot be substantiated by a legitimate interpretation of the Treaty itself. I mention particularly the replies to the Questions put forth by the National Aid-Society, because these replies contain the views of Officers, and others, who acted as members of the Staff of the



Society on the Continent during the late Franco-German war, and of some others who were officially engaged in reporting on the practical working of the Convention during the war, and who, therefore, of all others might be supposed to be well acquainted with the provisions of the Treaty in question, and their respective limitations. Nor are the notions, which I expect I shall presently be able to convince you are erroneous notions, regarding the Geneva Convention, of trifling importance. On the contrary, they appear from the extent to which they prevail, to be causing the Convention itself to be regarded with very great suspicion and distrust, if not to be exciting hostility against it; by these means, to be raising obstacles to its legitimate and intended action in the future, should occasion unhappily arise for its application.

As I have referred to the questions and replies published by the National Aid-Society on the results of the experiences of its Staff, I beg to be permitted to say a few words respecting the Society and its late work, before I proceed to the consideration of the special subject of to-day's lecture.

I have no intention to refer to any particular part of the work in which the Society was engaged during the war; I only wish to express an opinion of its general results. The early history of the Society, its extensive and varied operations, have already been described in this theatre by the one, who, of all others was the most competent to do so, Colonel Loyd-Lindsay;\* with, however, I must say, one exception—that exception being the very important part which he himself took in its establishment, its administration, and its success. I had the honour of being present at some of the preliminary meetings of certain members of the Fraternity of St. John; and admitting all due weight to the influence of this fraternity, particularly to the exertions of two of its members, Mr. Furley and Captain C. J. Burgess, I think all will agree with me when I say that the National Aid-Society only struck root after the earnest and energetic public appeal of Colonel Loyd-Lindsay, through the medium of the "Times," supported as it was by a most generous contribution to the subscription-list which he then opened. Neither should I omit to state, as I conscientiously can do from personal observation, that it was no less to his clear-sighted direction and promptitude of action, and unceasing devotion of his time and attention to the affairs of the Society, that its continued support by the munificence of the public, was mainly attributable. Every one felt confidence in the Society, from observing the manner in which its committee and agents worked under Colonel Loyd-Lindsay's guidance; no one doubted that whatever sums of money might be entrusted to it, would be laid out to the best advantage in the interests of the sick and wounded for whom they were intended; and so it was that funds and materials poured in from all sides, until they accumulated to the vast amounts which have been already described in Colonel Loyd-Lindsay's lecture.

\* See Colonel Loyd-Lindsay's Lecture on "Aid to the Sick and Wounded in War," delivered 31st March, 1871, and printed in Vol. xv, No. 64, of the "Journal of the Royal United Service Institution."



The question is occasionally raised, when the subject is reverted to in conversation, whether the benefits conferred by these vast gifts, repaid the outlay. I have no hesitation in saying that when all circumstances are taken into account, as they ought to be, the expenditure will be found to be quite justified by the amount of good effected. No one can study the subject thoroughly and impartially without coming to this conclusion. I myself, indeed, have been surprised at so much having been accomplished, considering the suddenness of the events which called the Society into existence; the absence of all preparation or previous organization to meet the wants suddenly created; considering the rapidity with which the successive phases of the war followed one another, each phase changing circumstances of place and requirements; and considering also, as I shall presently point out, that the Society's agents had no legal or authorised standing for interference at the seat of war: when all these things are taken into account, I think no other conclusion can be come to than that it is a subject for great congratulation that the Society was able to minister to the wants of the sick and wounded so materially, and to so vast an extent as it did.

I have endeavoured to make my conviction clearly apparent that the sick and wounded of both armies during the Franco-German war did derive material benefits from the English and other National Societies who interfered in their behalf, because I intend presently to ask the question whether, as a general principle, the plan of administering such international aid in time of war be deserving of encouragement or otherwise; whether there were not exceptional circumstances in regard to the late Franco-German war which prevented the harm resulting, which may be expected to result, if such international aid to contending armies be established as a system and applied to future wars.

Every one who reflects on the matter must become aware that the title of the British National Aid-Society was a misnomer, as were for the time being the titles of all the other National Aid-Societies who helped on the continent during the late war, with the exception of the German and French Societies. The funds were subscribed for international purposes; the work of the Society was international; and, to all intents and purposes, the Society was an International Aid-Society. Although thus thoroughly international and not national, it has been generally held and stated, not only that the Society was established under the warrant of the Articles of the Geneva Convention, but that the Articles of the Convention conferred on all those who were thus internationally engaged in aiding the sick and wounded, the privileges of neutrality and inviolability of person. It is this assertion on which I believe it to be important a right understanding should be come to; for that it is devoid of truth, the text of the Convention itself, as well as collateral evidence, will, I think, sufficiently show.

Is it true, however, that the articles of the Geneva Convention have been interpreted as I have mentioned? Is it true that the help afforded to the German and French sick and wounded soldiers by the English Aid-Society was supposed to be grounded upon, and to be facilitated



by, the terms of the German Convention? Quotation of a few of the published replies to one of the Society's questions will at once settle this point. Question, No. 12, is:—"Would it have been possible to have come to the aid of the sick and wounded, as has been done in this war, without the facilities afforded by the Convention?" Here are some of the answers. "Not to the same extent, if at all."\* "No."† "The Convention of Geneva has undoubtedly facilitated the aid afforded to sick and wounded in the late war; and this aid could not have been so effectually rendered without it."‡ "I am of opinion that it was owing to the facilities afforded by the Convention alone, that any effectual aid has been rendered by the National Society in the war."§ "Free locomotion in war time must always be difficult, and it would have been still more so had not the Articles of the Convention entitled all members of Red Cross Societies to circulate anywhere where their doing so did not interfere with military precautions or operations. The extent to which this was permitted may be inferred from the fact that newspaper correspondents frequently got attached to foreign ambulances so as to have the privilege of wearing their brassard, and penetrating where, as civilians, they would have been unable to reach."|| "Most certainly not."¶ "Utterly impossible."\*\*

These replies sufficiently prove that the officers and gentlemen who were acting under the directions of the British Aid-Society conceived that the Geneva Convention covered them with neutrality and protection, and that the Convention established a sort of right to administer help to the sick and wounded soldiers of the contending armies. Indeed, I need not rely upon the replies to the question which I have quoted, I may point to the whole series of replies to the questions put forth by the Society in proof of the universal prevalence of this belief among the respondents. One gentleman who was actively engaged in the work of the society informed me, on his return to England, that on one occasion, when he had been placed under temporary arrest by certain officers of the German Army besieging Metz, he had threatened to bring down upon them the interference of the British Government, his right to this interference being grounded on the Geneva International Convention of 1864. This is only one among many ways in which the mistaken supposition that the privilege of inviolability of person is conferred by the Geneva Convention on private gentlemen acting under the orders of an independent foreign society may lead to difficulties, but it serves to indicate how necessary it is that the nature of the Convention should be well understood, and its Articles rightly interpreted.

I formerly explained in this theatre the meaning attached to each article of the Convention by those whose business it had been to consider and define the terms of the Convention, but perhaps I did not enlarge enough on the limitations of the Convention in the particular direction I am now reviewing.†† Still I pointed to the fact that the

\* Captain H. Brackenbury, R.A.

† Seven Respondents give this reply.

‡ Colonel Cox, C.B.

§ Colonel Elphinstone.

|| Mr. Austin Lee.

¶ Captain Norman.

\*\* Dr. John Murray.

†† See Journal of the Institution, vol. x, page 162, *et seq.*—Ed.



Treaty only comprehended the military ambulances and hospitals of the belligerents, the staff employed in attending the sick and wounded contained in them, and the materials necessary for their proper treatment; that its Articles did not provide for any Volunteer or Independent Staff of Hospital Assistants; that such persons could only participate in the provisions of the Treaty by being regularly admitted into the hospital service and forming for the time being, part of the military establishments of the armies engaged, and thus becoming subject to the ordinary rules and articles of war. These latter would then come within the provisions of the Treaty, because then they would be comprised in the *personnel* of the military hospitals as laid down in the second Article of the Treaty.

To show how strictly the Treaty entered into by the different Governments of Europe confines itself to an acknowledgement of neutrality for the military hospitals of the belligerent armies, and to an engagement on the part of the belligerents to protect and respect them and their concerns only, I may point to the following circumstance. Prior to the Congress of 1864, in November 1863, an official circular was sent from Switzerland to the Governments of all civilized countries, making the following request:—"Would the Government give its adhesion to an International Convention having for its objects: 1st. The neutralization in time of war of military ambulances and hospitals, of the *personnel* of the official medical service, of voluntary hospital assistants (*hospitaliers volontaires*) recruited by the Aid Committee, of inhabitants of the country who will go to help the wounded, and of the wounded soldiers themselves. 2nd. The adoption of a distinctive sign, &c."

This circular formed the basis of the deliberations which subsequently took place in the International Congress of Geneva, of August, 1864. After full consideration of the several subjects included in the circular which I have just quoted from, it was unanimously determined to exclude from the text of the Convention that part of the circular-note which suggested the neutralization of voluntary hospital assistants recruited by Aid Committees, and to confine the neutralization to the official sanitary *personnel* of the hospitals of the belligerents. This was done because it was plainly seen that the extension of the rights then proposed to be conferred by the Treaty,—not merely the right to be acknowledged neutral, and to be treated as neutral, but the right, also, to special privileges of respect and protection,—to volunteers not subject to military control, and perhaps not conversant with military arrangements, would very probably lead to incessant practical difficulties in field hospital administration which would interfere with the interests of the sick and wounded soldiers, and not improbably, also to disputes and embarrassments with foreigners belonging to countries with which the belligerents were on friendly terms. It was, moreover, known

\* "Le Gouvernement adhérerait-il à une Convention Internationale ayant pour objet: A. La neutralisation en temps de guerre des ambulances et des hôpitaux militaires, du personnel du service sanitaire officiel, des hospitaliers volontaires recrutés par le comité de secours, des habitants du pays qui iront secourir les blessés, et des militaires blessés? B. L'adoption d'un uniforme ou d'un signe distinctif identique pour les personnes attachées au service de santé, &c."



that several Governments would not give their adhesion to any treaty containing such a provision; indeed, I was myself informed by the representatives of more than one Government at the Congress, that they had orders to leave Geneva at once, in case the insertion of the neutralization of Volunteers in the proposed Convention, was insisted upon.

The Geneva Convention is simply a Treaty entered into by certain Governments with regard to the manner in which the sick and wounded of their armies, the staff employed in ministering to them, and the military hospitals and hospital *matériel*, are to be respectively dealt with in case of two or more of those Governments waging war with each other. All allusion to Volunteers, even of the countries engaged in war,—I need hardly say, therefore, all allusion to Volunteers from other countries,—has been rigidly excluded from the conditions of the Treaty. The Treaty nowhere contains any reference to the neutralization of any one not forming part of the Staff officially employed in the service of the ambulances and hospitals of the belligerents; there are no stipulations in it regarding private persons.

The mistaken ideas on these points have apparently originated in several ways. The articles of the Convention have been read apart from the preamble, which designates who the parties to the Convention are. Some of the Articles have been read separately, without reference to preceding Articles by which their terms and provisions are limited. The error has probably also been increased by the fact that at several meetings of delegates from the National Aid-Societies of various countries, especially at Paris in 1867, efforts have been publicly made to get the Governments who have adhered to the Geneva Convention to sanction the admission of independent volunteers, recruited by Aid-Societies, into that treaty, or to give them, by an additional convention, the same protection as was conferred on the hospital establishments of their respective armies by the original Convention. Had the Governments of Europe complied with these requests, the agents of the British and all other Aid Societies would have had a legal status at the seat of war. But no such state treaty has been entered into, and, until this occurs, it is obvious, that the agents of Foreign Aid-Societies can only enter upon a theatre of warfare as private persons, with no claim to any exception to the restrictions which are usually imposed in time of war.\*

\* Among the projected modifications of the Geneva Convention of 1864 which were discussed, and proposed for adoption, on the occasion of the International Congress at Paris in 1867, were the following:—

“The members of all national societies for succouring the wounded combatants of land and sea forces, likewise their auxiliary *personnel* and their *matériel*, to be declared neutral.”

“The societies of succour shall put themselves in direct correspondence with the head-quarters of Armies, or with the Commanders of naval forces, by the medium of representatives.”

“The societies of succour, on the consent of their representatives, at the general head-quarters, or with the Commanders of naval forces, shall be empowered to send delegates to follow armies or fleets on the theatre of warfare, and to second the medical and administrative service in their functions.”

Again, the fourth subject in the list of propositions put forth for discussion by



The assumption that it was by virtue of the Geneva Convention foreigners gave aid to the French and German sick and wounded soldiers during the war, was manifestly all the more groundless, because among those who were actively engaged in this work were citizens of the United States of America. One of the field hospitals administered under the English National Society, and one which had the opportunity of being of essential service from finding itself in a position where large numbers of French wounded happened to be gathered without almost any of their regular military medical staff, was composed partly of American and partly of English gentlemen, and was known as the "Anglo-American Ambulance." Some other hospital establishments during the war were wholly served by Americans. Now, the Government of the United States of America, although it has been specially appealed to several times on the subject, notably after the Berlin Congress of 1869, has always declined to join in or to accede to the Geneva Convention; nor has the United States' Government entered into any treaty with European Governments of a nature corresponding with the Geneva Convention. Manifestly, therefore, the American surgeons and nurses were not acting in France by virtue of any compact such as the Geneva Convention is.

In truth, Americans were acting, as all the other foreign volunteer hospital aids were acting, in great measure through the concurrence of fortuitous circumstances incidental to the great struggle which was in progress, the complete success on the one side and the utter break-down on the other, the rapid succession of events, the extent of territory over which the warlike operations were spread, the prolongation of the campaign during the winter season, and, as a result of these conditions, the immense demands for hospital necessities, food, wine, clothing, instruments, medicines, surgical articles of all descriptions; so that the military authorities on both sides were prepared to welcome persons who did not come empty-handed, but, on the contrary, who came with almost unlimited resources and abundant stores ready to be given away on demand. They were there by sufferance of the contending armies, who were glad enough to receive the donations brought by them; not by any right conferred through the Geneva Convention.

The published replies to the questions put forth by the British Aid-Society contain many complaints on the manner in which the Articles of the Geneva Convention were executed during the war by the belligerents, and the question is discussed in them whether, in consequence

the International Committee of Geneva, and read at the first sitting of the second Geneva Diplomatic Congress of 1868, was the following:—

"4<sup>o</sup> Mettre le personnel des sociétés de secours au bénéfice de la neutralité."

These facts afford a sufficient proof of the interpretation put upon the Geneva Convention by the distinguished delegates of the National Aid-Societies who met in Paris in 1867, and by the International Committee of Geneva in 1868. The Diplomatic Congress that sat at Geneva in October, 1868, however, notwithstanding the application for the volunteer *personnel* of National Aid-Societies to be included in the provisions of the Geneva Convention of 1864, only extended its principles to maritime warfare; they left the text of the original Convention, regarding military operations by land, intact, and thus a second time fixed the principle of applying the privileges of neutrality to the hospitals and official *personnel* of the belligerents only.



of the particular matters complained of, it does not become necessary to alter the text of the Convention. I have examined these complaints carefully, and have found in nearly every instance that the complaint is based on the mistaken reading of the Convention which I have just been discussing. The complainants have presumed on themselves, or property in their charge, being entitled to special rights, to immunity from the usual results and incidents of a state of warfare, which no one had agreed to confer on them. As to the alleged violations of the Geneva Convention elsewhere published, many of them—not all, it must be admitted, but many of them—are traceable to the same cause, viz., a mistaken notion of the nature of the Convention itself.

The Geneva Convention was thoroughly studied in Germany a considerable time before the war of 1870 broke out. Instructions issued by the Ministry of War made all the Officers and soldiers of the Prussian Army and allied German States acquainted with its Articles. A complete code of regulations was prepared by the War Department for the guidance of the National Help Societies to Sick and Wounded, defining their organisation, administration, positions of action, and duties of all persons employed by them, with their relations to the regular Hospital Staff of the Army Medical Department and to all other military authorities in case of war occurring and the Armies of North Germany becoming mobilised. The National Help Societies were restricted from collecting or practising for future use any stretchers or other ambulance conveyances, any hospital appliances but such as were of the patterns authorised for the military hospital equipment, so that there might be no jarring or confusion in case of the national volunteer aid having to be incorporated with the official services to meet the exigencies of war. In short, all the necessary preparations were made by the Prussian Government in strict accordance with the spirit and text of the Geneva Convention, and, there is no reason for doubting, with full intention of carrying out its provisions in their letter and in their spirit.

On the other hand, the French Government had done scarcely anything of practical value in the matter since the time it had acceded to the Convention. The Articles of the Convention had not been made known to the Officers and men of the Army, and, as might be expected, they exhibited an amount of ignorance regarding the Treaty and its objects such as at the time provoked general comment. At first, indeed, not simply the soldiers in the ranks, but many of the Officers, including those of the Hospital Staff, were manifestly not aware even of its existence. No regulations had been prepared for incorporating the volunteer with the official Army medical service when the war commenced, and, as an inevitable consequence, all was uncertainty and bewilderment in this direction at starting.

Permit me to quote a short passage from an able essay on "Hospital Administration in Modern Armies," by a French writer, in a recent number of the "*Revue des Deux Mondes*,"\* to confirm what I have

\* *Le Service de Santé dans les nouvelles Armées Européennes, observations et souvenirs de la dernière guerre*, par M. Léon Le Fort, Chirurgien en Chef des Ambulances de Metz.—*Revue des Deux Mondes*. Tome xvi, Nov. 1871, p. 124.



just said. "Unhappily," he writes, "the Convention of Geneva was hardly known to the French Military Intendance, and at the opening of the war nothing was prepared to put it into execution. When we arrived at Metz, not a French Army surgeon, not a single infirmier wore the brassard, not one of the ambulance vehicles had on it the distinctive sign of neutrality." And the same writer shows that when the authorities of the French Intendance subsequently applied the Convention, either from carelessness or from not properly appreciating its terms, they issued their stamped brassards in profusion to persons not entitled to receive them. Thus the very authorities whose duty in France it was to see that the Articles of the Convention were strictly adhered to, neglected the Convention in the first instance, and contributed to its abuse in the second. No wonder that a marked change occurred after this time in the respect paid by the Germans to the French official brassards. No wonder also that a necessity is generally felt for a revision of the Convention of Geneva with a view to determine whether the limitations of its articles can be more strictly enforced, and whether, in the interests of the sick and wounded, it is possible to punish abuse of them by any other means than retaliation.\*

The remarks I have hitherto made have shown that the only Aid-Societies capable of being brought within the Geneva compact of 1864 are the National Aid-Societies of the countries at war with each other, and that in order that the *personnel* of these societies may have a legal title to the protection accorded by the treaty, that *personnel* must be placed under military regulations during the period of service, incor-

\* General Dufour, Honorary President of the Geneva International Committee of Aid to Wounded Soldiers, has circulated for consideration by the National Aid-Committees, an essay recently read by M. Gustave Moynier, in which the creation of an International Court in time of war is proposed with a view to effect the repression of violations of the Convention of Geneva. M. Moynier, after showing the need which exists for such a judiciary institution, after indicating the various plans which have been previously proposed or employed for ensuring due observation of international laws and treaties, and referring to the constitution of the Committee of Arbitration agreed to by England and the United States with regard to the Alabama claims, reduces his scheme to the form of a projected Convention embracing ten Articles. The following extracts exhibit the principal points contained in them:—

Art. 1. In order to ensure the execution of the Convention of Geneva of the 22nd of August, 1864, there shall be constituted, in case of war between two or more of the Contracting Powers, an international tribunal to which all complaints of infractions of the said Convention shall be addressed.

Art. 2. This tribunal shall be formed in the following manner: As soon as war has been declared, the President of the Swiss Confederation shall designate by lot three of the Powers who are signatories of the Convention, excluding the belligerents. The Governments of these three Powers, as well as those of the belligerent States, shall be each asked to nominate an Arbiter, and the five Arbiters shall assemble without delay at the place provisionally indicated by the President of the Swiss Confederation.

Art. 3. The Arbiters shall determine for themselves their definitive place of session. The details of organization of the tribunal and course of procedure shall be left to them.

Art. 4. The tribunal shall only occupy itself with violations of the Convention respecting which complaints shall be made by the Governments concerned. The tribunal shall submit the alleged violations to a searching enquiry. The necessary facilities



porated, indeed, for the time being with the staff of persons employed by the War Department of the Government concerned in the military hospitals, and must be occupied in one or other of the capacities particularized in the terms of the Convention itself. Only while so engaged, and on no other conditions, can such persons claim a right to participate in the benefits of neutrality, to use the language of the Convention. Persons belonging to the National Aid Societies of non-belligerent countries, although the Governments of these countries may have acceded to the Convention, cannot through an *international* action, lay claim to any corresponding immunities or privileges under the Geneva Convention.

I will now glance at the question—is it desirable to establish systematically a plan of international aid, such as was afforded during the late war? Or that the provisions of the Geneva Convention should be extended to persons of neutral countries carrying international aid to the sick and wounded of armies at war with each other?

I have already acknowledged that a vast amount of benefit was conferred on the sick and wounded of the contending armies during the Franco-German War by the international aid which was afforded to them. It by no means follows this admission as a matter of course, however, that what was done during the late war can be done again with equal advantage in future wars, or, at any rate, that it would be judicious for a body to be permanently organised for affording such assistance. The question is a very serious one from whatever point of view it is looked at, and much may be said on both sides of it; but although cogent arguments may be urged on the score of common humanity, and our feelings strongly moved by appeals to this consideration, my present conviction is that such a system, if established, would be attended with a greater amount of evil than of good. That a nation should be always prepared for war, to defend itself if need be against insult or injustice none will gainsay; but it must be equally the wish of every right thinking person, that nothing shall be done which shall render the occurrence of war easy, or facilitate its continuance when once it has commenced. Now, although the existence of International Aid Societies, if they were to be established and acknowledged by treaty as some contemplate, might have little *direct* influence in provoking or averting appeals to battle by states for the settlement of their differences, there can be little doubt but that an important *indirect* influence would be exerted by them. One of the greatest incumbrances of an army in the field is its sick, together with the wounded which remain after a general engagement; and the

for instituting this examination shall be accorded by the signatories of the Convention, and especially by the belligerents.

Art. 5. The tribunal shall formulate its opinion in a verdict of guilty of violation, or not guilty for each case brought before it. If guilt be established, it shall pronounce a punishment conformably to an international penal law which shall be made the object of a Treaty forming a complement to the present Convention.

Art. 6. The tribunal shall notify its judicial decisions to the Governments concerned, and these Governments shall be held responsible for inflicting the sentences pronounced against those of their subjects who have been guilty of infractions of the Convention.



weight of this incumbrance has been vastly increased since so much public attention has been given to all that concerns the proper care and treatment of such disabled soldiers. If the sick and wounded are very numerous, the mobility of the army is for a time paralyzed, so long as the army has only to rely on its own resources for their surgical care and transport. But if a system of international aid be legally established and thoroughly systematised, these difficulties will in a great measure be removed. The sick and wounded will be given over to the care of international volunteer hospitals, and the mobility of the main part of the army will be restored. The Commander of the Forces will be at once ready to march onward, and, should occasion occur, to fight another battle. Thus the very object for which such societies would be established—that of mitigating suffering—would be defeated. There would be multiplication of wounded, and, in the end, unless the international aid were almost unlimited, less attention would be given to them. This is one important reason why the establishment of a system of international aid in time of war appears to me to be a thing not to be desired, even if it were generally practicable. Before the outbreak of the late war, no such system of international help had been established; and, therefore, the help which was afforded could exert no influence on the preparations made by the respective armies to meet the wants of their sick and wounded. All that was done by the British aid internationally given was so much in excess of what the sick and wounded would have had without such assistance; and hence the objects of the subscribers to the funds of the English Society were fully carried into effect. But if similar assistance is to be relied on in case of future wars of which this country might be a neutral spectator, who can say how far this reliance may influence the extent of the preparations made by the states entering upon the war for their hospital services? These are grave considerations which certainly ought to be well weighed in this country, where liberality, and the means of liberality, so much abound.

With these views regarding the doubtful expediency of systematizing international aid in time of war, I need hardly say it was a source of satisfaction to me that, although the work which called our English society into existence was really international work, one of the principles of its existence, and the first among them, was settled at the public meeting held at Willis's rooms on the 4th August, 1870, to be the contribution of aid to the sick and wounded forces of our own nation. This principle I hope will be mainly kept in view in the future. In this country especially, there appears to be a legitimate field for the operations of such a society. There are not in Great Britain the same facilities for making adequate provision to meet the requirement of the wounded in time of war as exist in other European States. In considering the best practicable arrangements for the proper care of the wounded in war time, the effects of the system of enlistment as compared with one of conscription force themselves on our attention, just as much as when the organization of the British Army at large has to be considered. Where an army is raised by conscription there is comparatively no difficulty in calling such numbers into the ranks that an



adequate proportion may readily be withdrawn for training, and, on need arising, for acting in the special duties of bearers of sick and wounded, without material injury to the fighting strength. But when an army is composed of men collected by the costly process of enlistment, it is unreasonable to expect a like proposition to be available; at any rate, it is hardly likely to happen that the necessary numbers ever will be found to be spared from the combatant ranks for such training and duties. The combatants of an enlisted army must always be comparatively limited in number, and no avoidable diminution of that number is likely to be permitted. When active hostilities are in progress the concerns of the sick and wounded, from the very nature of war, will always be a secondary consideration. Now, however, that the regular army is strengthened not only by its Militia reserves, but also by a numerous Volunteer force, may not the latter be got to supply, under proper direction, at least for home service, a proportion of men willing to undertake those duties in aid of the sick and wounded, which in some continental armies are performed by a proportion taken from the companies of regiments? May not the collecting, training, and preparing Volunteers for the discharge of these duties form part of the work of the National Aid-Society? In case of a force consisting of Army, Militia, and Volunteers being brought together for defensive purposes in this country, it will be manifestly essential that the hospital arrangements for the sick and wounded, including the Ambulance Transport arrangements, shall be under the one supreme direction of the War Department; but it is impossible for this department of the Government to maintain in time of peace the number of Hospital Assistants and trained attendants who will be required in time of war, not only for meeting the first necessities of the wounded, and for conveying them from hospitals in front to others in rear, but also for giving that care and attention to them which become necessary for long periods subsequently. No Government has ever yet been able to do it, nor is it likely will ever incur the expense which would be involved in such a proceeding. But unless the persons who are to bear the wounded from fields of action, and who are to help in removing and attending to them afterwards, are properly trained and disciplined in time of peace, they are not likely to be of much use, are often likely to do much harm, when so employed in time of war. Few are aware how many lives and limbs in time of war, that might under other circumstances be saved, are destroyed by want of requisite knowledge for the discharge of these duties. A corps of trained bearers, composed of volunteers, whether organized into a distinct body available for service, wherever required, or collected, on occasion arising, from trained men out of the companies of Volunteer regiments, would constitute a body corresponding in its functions with those of the *personnel* of the Sanitary Detachments of German Armies, and might be turned to valuable account in many ways, while military operations were in progress.

I think we are justified in believing that the establishment of National Societies for Aid to the Sick and Wounded of Armies in time of War has obtained so deep and extended a hold in Europe, that no



efforts made by persons who object to their existence will succeed in uprooting and putting an end to them. If this proposition be assented to, all must agree that the consistent and wise part will be so to direct their action, that no impediments to the military operations in which armies are engaged shall result from it, no risk of international difficulties be engendered; but, on the contrary, that their action shall be made to conduce, to the fullest practicable extent, to the mitigation of those sufferings to which the Societies owe their origin, and on account of the existence of which they are supported.

Regarding our own National Aid-Society from this point of view, considering its main purpose to be that of supplementing the regular hospital service of the War Department of the Government in case of the country becoming involved in war, the following appear to me to be principles which it is essential for the Society to adopt in order that its aid functions may be most efficiently discharged.

1. The National Society should direct its efforts in the first instance to procure official recognition, not merely as an independent body invested with special privileges, but as a Hospital Reserve for Help to the Sick and Wounded of our National Forces. It should seek to establish definite relations with the War Department through a representative Director of the Volunteer Aid Establishment.

2. The Society should devote itself to national interests. It should try to solve the important questions—in what direction, and by what means it can best supplement the official aid to sick and wounded in case of the country becoming involved in war, always keeping in view the special circumstances of the country, and of its Army organization. After these questions have been solved, it should take whatever steps may appear to be best suited for preparing itself in time of peace to meet the exigencies which it believes itself competent to meet in time of war.

3. A code of regulations should be prepared, and, when sanctioned, issued by authority, defining the duties and responsibilities of the Volunteer Hospital Staff, acting under the direction of the Society, in the same way as regulations are issued for the guidance of the combatants of the Volunteer Forces.

I have not attempted to discuss details, for it would be useless to do so before the principles of action I have named are approved and accepted. If these principles become established, the best method of filling up the outline sketched out, will necessarily form a subject of subsequent study. They are the principles on which alone, I believe, the Society can hope for its future operations to be attended with unmingled and reliable good results. If they be rejected, if the Society trusts to its own powers as a free and independent body, if its members confide in some presumed influence of the Red Cross without inquiring particularly into the statutes and limitations under which this sign has been accepted as an emblem by international treaty, I fear the Society will never be able to justify the name under which it exists; while, on the contrary, by adopting and acting upon them, I believe the Society may become an institution capable of affording essential assistance to our Government and country in the hour of need.



## APPENDIX.

It may be useful to indicate, in some particulars, the manner in which the German War Department dealt with the Geneva Convention by official regulations prior to the outbreak of hostilities with France. A reference to some of the provisions of the Royal Warrant of the 29th of April, 1869, defining the "Plan of Mobilisation for the North German Army,"\* together with a few extracts from the German Army Medical Field Regulations, will suffice for this purpose. First, with regard to the Royal Warrant above cited:—

1. This Royal Warrant contains, as an appendix, a reprint of the Articles of the Geneva Convention.

2. A section of this Warrant, headed "Instructions for the Army Medical Department in the Field,"† has been supplied by the War Office to all Officers commanding troops; and it is assumed that all combatant and medical Officers are thus acquainted with the instructions and with the Articles of the Geneva Convention. The troops also are made acquainted with them through the authorised courses of instruction given by Officers to the Serjeants and men at fixed intervals.

3. These Instructions contain the following passages:—

a. All persons belonging to the Army Medical Department must be provided, as soon as war commences, with the Neutrality-badge; Surgeons, Military and Civil Officers connected with hospitals, Hospital Orderlies and Bearers of Wounded being comprised in this category.

b. All ambulance conveyances, field hospital carts, waggons, and hospital tents, have to be marked with the neutrality sign.

4. The Directing Surgeon of each army corps, or, as representing him, the Surgeon in charge of a detached body of troops is required to designate beforehand the Surgeon, or Assistant-Surgeons, Orderlies, proportion of ambulance stores, and transport which, on events requiring it, such as wounded having to be left on the ground, &c., are permitted to take their risk of falling temporarily into the hands of the enemy under the protection of the Geneva Convention.

Further extracts from the Instructions for the Army Medical Department, before named, bearing on the subject of the Geneva Convention of 1864:—

Para. 2. The sick and wounded of allied troops, as also sick and wounded prisoners of war, are equally entitled to medical treatment.

Para. 7. During minor engagements the wounded will be taken to the temporary places for dressing wounds by the assistant sick bearers. As far as possible four men per company will be selected for this purpose from the men who have already been trained to this duty in time of peace. They will be distinguished by the white armlet with red cross worn on the left arm.

Para. 13. Temporary hospitals are to be denoted by the National Flag, and by a flag with red cross; after dark by a red lantern.

\* Mobilmachung's Plan für das Norddeutsche Bundesheer.

† Instruktion über das Sanitätswesen der Armee im Feldr.



Para. 19. In the event of a retreat, the Commander of the Sanitary Detachment must arrange that both men and *matériel* follow the Army. The Principal Medical Officer determines who of the surgeons and their assistants, with the necessary appliances, are to remain with the wounded under the protection of the Geneva Convention.\*

Para. 24. The hospital buildings will be distinguished by the National Flag, and a white flag with a red cross.

Para. 25. In the event of a retreat, the Principal Surgeon of a field hospital is responsible that the transport as well as men and *matériel* not required, follow the Army, if possible, in conjunction with the nearest sanitary detachment. The personal assistance required by the sick who have to be left behind, will be determined by the Principal Medical Officer, and only follows the Army after assisting in the further treatment and care of the sick.

Para. 79. The armlets with red cross issued to persons belonging to the volunteer establishments, must bear the stamp of the Royal Commissioner, who is further required to furnish each person, to whom an armlet is issued, with a certificate of authorisation to wear the Badge of Neutrality.

List of persons taken from the Dress Regulations, who are to wear the *brassard*, or arm-badge, in time of war.†

During war the following are entitled, and respectively obliged, to wear the white armlet with red cross, the Badge of Neutrality of the Geneva Convention:—

1. Medical Officers in charge, and their assistants.
2. All persons belonging to Sanitary Detachments, Field Hospitals, and Hospital Reserve Depôts, as also the Hospital Reserves.
3. The Medical Officers, Hospital Assistants, Assistant Sick Bearers and train soldiers, with the regimental cars, and the train soldiers of the Medical Officers.

The armlets, which are to bear the mark of the regiments or corps in the middle of the joining, will be worn on the left sleeve of the coat or cloak in the middle of the upper arm.

Sir HARRY VERNEY, on moving a vote of thanks to Professor Longmore (which was seconded by Colonel Alcock), said: I feel sure that I speak the sentiments of all present by expressing our thanks and acknowledgements to Professor Longmore for the admirable paper which he has sent to us, and which Professor Maclean has just read. The interest taken in the subject of it by the whole nation was amply shown, not only by the very large contributions in money, and materials of all kinds, in the summer, autumn, and winter of 1870, but still more by the personal work of so many persons of both sexes and of all ranks, both at home, and when they proceeded to the seat of war, and aided in mitigating the sufferings of the battle field.

\* The Articles of the Geneva Convention are appended in extenso to this paragraph. (Beilage 4. Instruktion, &c., page 110.)

† Beilage 17. Nachweisung der Uniformen und Abzeichen des Sanitäts-Korps. (Instruktion, &c., page 159.)



But what has hitherto been wanting has been the intelligent direction what to do, and how to do it—how to utilise the efforts of zealous benevolent persons for the objects that we all had in view. That want is supplied by Professor Longmore's paper. He has given us in it the result of his thoughtful experience. He has pointed out how our efforts ought to be combined with, and, of course, in subservience to, the arrangements of the War Office and Government of the country, in case our armies should be called into the field. He has shown how we may be of use, without exciting the jealousy of our own or foreign authorities, and how we may act with that which, above all, is essential,—the goodwill and co-operation of our own military commanders.

There is no doubt that in the Franco-German war, the Red Cross was abused. He tells us how its abuse may be—indeed must be—avoided in future.

I believe that many of us are convinced, that only by regulations such as Professor Longmore suggests, and acting vigorously under them, will the "Aid Society to Sick and Wounded in War" be able to carry out the objects for which it exists. We shall all study his warnings and admonitions, and they will be especially valuable to the Council of the Society, furnishing to them information and advice for the work which they have to undertake in directing the future operations of the Society.

We also thank Professor Maclean for his statement on the important duties of the trained Krankenträger, a statement founded, apparently, on his personal observation, and so pertinently illustrated by his reference to the case of that gallant American General, Stonewall Jackson, whose course we all, whether favourable to the North or South, followed with admiration, and whose untimely death we could not but deplore.\*

\* On this point Professor Maclean observed, it is a great mistake to suppose that any men picked up in the street, or even taken from the ranks, are capable, without special training, of performing the duties of an Army Hospital Corps. On the contrary, it may with truth be described as a species of skilled labour. In the case of a man in the field, let us say with a simple fracture of a limb, if unskilfully handled by untrained men, the injury may in a moment be converted into a "compound" one, to the serious detriment of the sufferer, and in some cases fatal consequences may result. In this way the good and gallant Stonewall Jackson lost his life. He was wounded, but not mortally. The soldiers who removed him from the field did this in so unskilful a manner that death resulted.







No 15

INTRODUCTORY LECTURE

DELIVERED AT NETLEY

ON COMMENCING THE TWENTIETH SESSION

OF THE

ARMY MEDICAL SCHOOL,

*1st APRIL, 1870.*

BY

DEPUTY INSPECTOR-GENERAL T. LONGMORE, C.B.,

HONORARY SURGEON TO HER MAJESTY; PROFESSOR OF MILITARY SURGERY  
IN THE ARMY MEDICAL SCHOOL, ETC., ETC., ETC.

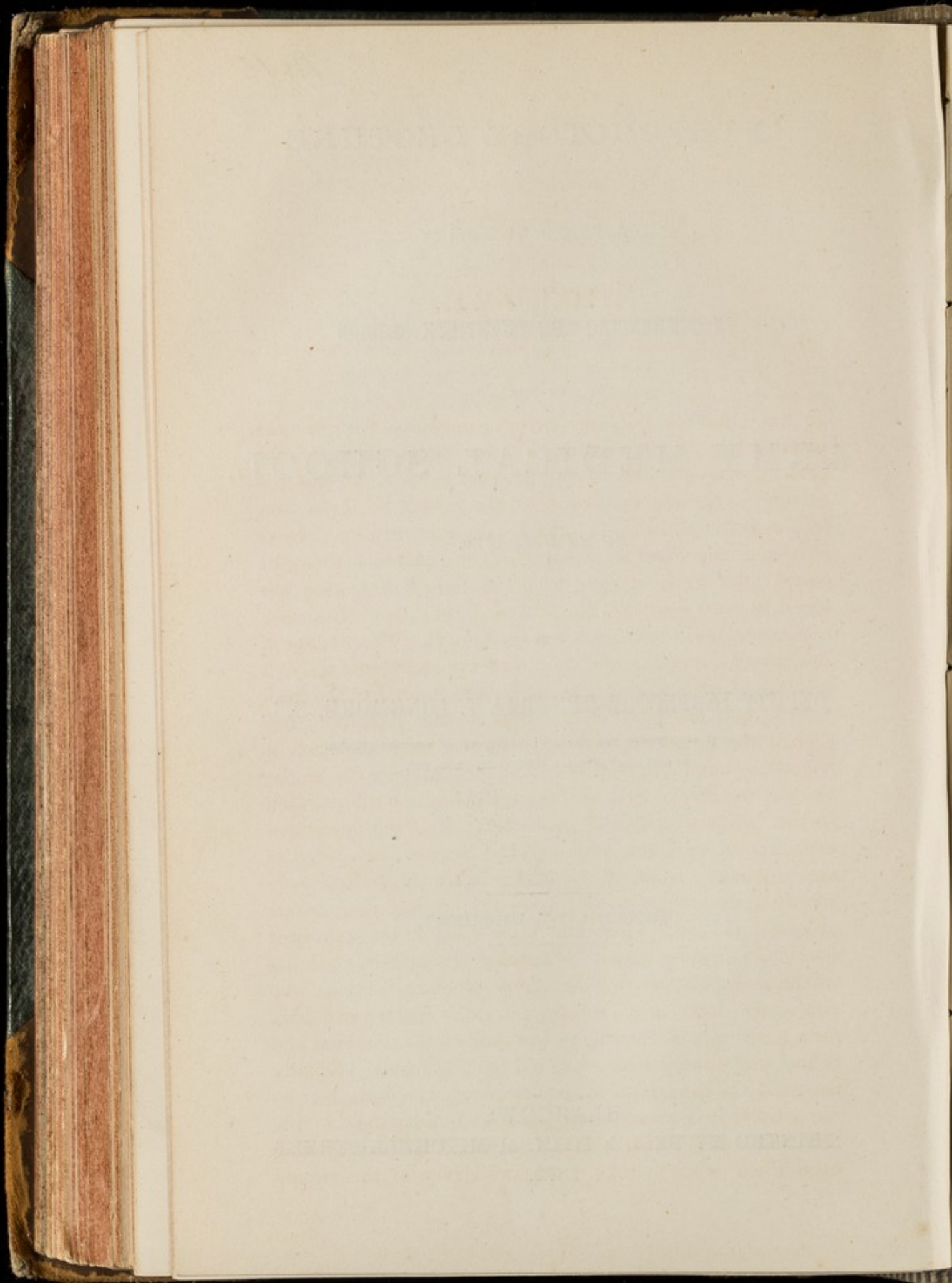
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## LECTURE.

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It has come round to my turn to deliver a few remarks introductory to the opening of the regular work of the present session of the Army Medical School. It was the custom in the earlier sessions of the School to invite professional friends, and to give a set introductory lecture at the commencement of each session. After a time the search after fresh subjects for these formal discourses was found to cause a tax on thought and time more than commensurate with the resulting advantages. The Senate of the School then permitted their discontinuance, and the first meeting of each session has since been limited to the fresh comers, and the staff of the School and Hospital. But though the formal introductory lectures were abolished, it has been found impracticable to enter at once upon the work of the School, just as if there had been no interruption in the ordinary course of instruction; as if the gentlemen just arrived and the staff of the School were familiar acquaintances; as if, in short, the work of to-day were simply a continuance to all concerned—old and new stagers alike—of the work which had been going on for some time previously among them. Naturally the officers holding established positions in the Army Medical Service, who now come here in a certain sense as Volunteers, look for a few words of greeting;—the staff of the Hospital and School are equally anxious to bid them welcome. Equally naturally the candidates for commissions, who come here as competitors in a struggle for place and distinction in the new and untried sphere of action which is just opening upon them, wish to take a general survey of the ground



over which the race is to be run, and to form some plan for the start; and equally those who are to back them in their race feel a desire to offer advice and encouragement, and to help in their efforts whosoever may feel the need of such support.

Then again changes in circumstances and relations take place—and what important changes in all military arrangements are taking place in the present time! and how rapidly they succeed each other!—and some of these changes almost of necessity demand a passing allusion, perhaps explanation, on our first meeting. Hence it is that although I do not come before you for the purpose of delivering a set introductory lecture on the School and its work, nor with the intention of now commencing that part of the School instruction which falls within my particular province, I yet ask you to give me your attention for a short time while commenting upon a few matters which are of common interest to us all.

In thinking over the remarks I should make to you to-day, the first thing that came to my recollection was that I should be now inaugurating the twentieth session of the School. When this session is over the Army Medical School will have completed the first decade of its existence. It is now nearly ten years ago since the first lecture of the School was delivered, and since it was my duty to deliver that lecture. I can well recall that occasion, for it was the first on which I had ever made a public address; and it was a great change from what had been my previous occupations in the public service. I can well recall it also, for among those who listened to me and took part in the proceedings were some who were then conspicuous from their influence on public affairs, and well known for the interest they took in our department. Some of them now live only in memory. There was Sidney Herbert, who, as President of the Royal Commission which, after prolonged inquiries and deep consideration, had recommended the establishment of the School, was so far responsible for its origin; and who, subsequently becoming Minister for War,—the position he



held when attending the opening lecture of the School,—had in this way become officially responsible for its organization. Little did any who on that occasion observed Mr. Sidney Herbert's fine and stalwart frame, and who heard the warm expressions of interest in the Army Medical Department and its work which he then uttered, think otherwise than that he would live many years to watch over the progress and development of the establishment he was inaugurating. How shortly afterwards he passed away need not now be mentioned; his untimely death, and the steps publicly taken in London and elsewhere to establish lasting memorials of his private worth, his devotion as a statesman, and, above all, his great exertions in the cause of sanitary improvements in the Army, must be familiar to all.

For a long time the Army Medical School was without any memento of its official founder; but, though neither bust nor portrait of him yet graces its walls, the institution of the "Sidney Herbert Prize," which was one of the objects of the great meeting in London, over which His Royal Highness the Duke of Cambridge presided, and which is now awarded each session to the Medical Cadet who chiefly distinguishes himself in the work of the School, will constantly bring him to the remembrance of all connected with the establishment. The Director General of our Department, who was present at the opening of the School, Sir James Gibson, too, is no more among us. Only those who were intimately associated with him are aware how much kindly feeling, and how strong an interest in the welfare of the Department and its officers, were veiled under the cold exterior which unfortunately prevented him from becoming a general personal favourite. No man had a more earnest desire to do justice to the Officers of the Department over which he presided, or took more pains in trying to promote the interests of those who distinguished themselves by their industry and intelligence than Sir J. Gibson; indeed, it may be said with truth, that the close and prolonged inquiries which he made while seeking to distribute, with the utmost impartiality, certain very influential appoint-



ments among officers the most fitted to fill them, and to those officers only, acted as the final strain under which his already weakened health eventually broke completely down. His work really killed him, as it had done his predecessor, Dr. Alexander, and both alike fell honourably at their post of duty in the public service.

I have looked at the number of candidates for commissions who have since that opening day come to the Army Medical School, and I find that the number (both branches of Her Majesty's service included) is 730. Of this number, 485 have belonged to the general service, and 245 to the Indian service, including the ten gentlemen who have arrived this session. I have not been able to ascertain how many of those who passed into the Indian Medical Department still retain appointments in Her Majesty's service; but, of the 485 gentlemen of Her Majesty's British service, 424 only are holding commissions as Assistant Surgeons at the present time, showing a diminution from various causes, exclusive of promotion, of sixty-one, or one-eighth of the whole number since the opening of the School. During the last three sessions, including the present, and on one previous session, no candidates for Her Majesty's British service have come to the School; and, as there is still a considerable excess unabsorbed owing to the reductions in the army, it seems probable that none will arrive for several sessions more. As an instance of the rate at which absorption sometimes goes on in our ranks, I may mention that there were twenty-nine Assistant Surgeons passed out of the School at the end of its first session into the British service, and that, instead of the twenty-nine, the Army List now only shows seventeen. An absorption approaching one half in less than ten years is a great diminution in number, when we remember that it has occurred from causes irrespective of promotion. A few years ago, Assistant Surgeons of nearly ten years' standing, which is now the position of those who remain of the twenty-nine Assistant Surgeons who entered the service at the first session of the Army Medical School, would have been looking forward to take the higher standing



of the rank of Surgeon; but the prospect of promotion is I fear for them, as it is for officers of all other branches of the military service, a distant one, though circumstances lead to the hope that it is not so distant as some assert. It is fortunate for them that they have a higher relative rank, and a far higher rate of pay, than were enjoyed by most of those who are their seniors in the service, in their earlier years. I am happy to hear also, that the title "*Assistant Surgeon*," is about to be removed, as it does not appear to be of any essential utility, and is well known to have been a source of dissatisfaction to some who have been holding it.

Speaking of the change in designation of the junior ranks of the Army Medical Officers, leads me to allude to the more important change which has recently taken place in the organization of the Army Medical Department,—the discontinuance of the double classification of its members into *Staff* and *Regimental*, and, instead, the adoption of a system by which the two sets will be blended into one. A recent general order has published the fact, that medical officers no longer form part of regimental establishments.\* The importance of this change cannot be over-rated. It seriously affects the position and arrangements of a large number of officers who are at present holding regimental commissions, and it hardly less affects those of the executive ranks on Staff employ; but the change is far more important in regard to the future condition and prospects of the Army Medical Officers, regarded as a professional body, and also in regard to its probable influence on the plan on which the Hospital service of the army, especially in time of war, will be hereafter conducted.

To many regimental officers it will be a source of much disappointment. Officers who had considered themselves to be permanently fixed in their regiments, and who, in many instances, had given considerable sums of money to get positions which they calculated would keep them at home as long as they remained in the public service, will find themselves suddenly dis-established. Although the

\* G. O. 28, 22d March, 1870.



purchase of these positions has not been officially recognized, still the fact of such bargains being made has always been tacitly assented to, like the over-regulation purchase of steps in the combatant ranks; and I hope that, in the change, due consideration may be shown to the circumstances of such officers.

But it has been foreseen for a long time past, that the duration of the Regimental Medical System was approaching its termination. This system was almost a necessity when the British Army was scattered by regiments, and by portions of regiments, not only over Great Britain, but over all parts of her colonial empire. But since the plan has been to collect troops in camps and garrisons at home, to withdraw regiments and detachments from outlying dependencies abroad, and to concentrate them in defensible positions and places whence their combined military strength, in case of need, could be exerted in any given direction with most efficiency, no such necessity has been felt. Not only, indeed, has no necessity for the system as regards the medical service been felt, but it has been proved to be, under the new circumstances of the troops, even on home service, a source of waste of professional power, of useless multiplication of surgical equipment, and consequently of fruitless expense.

In time of war the system has constantly broken down. In the early struggles of the Crimean War, while the Medical Officers of the French Army, by concerted efforts directed by central authority, were able to dispose of their wounded with regularity and comparative speed, the disconnected efforts of the Regimental Officers, and the limited number of the Medical Staff Officers, in the British service, led to great delays and difficulties. The Medical Officers of some regiments were overtaken with the number of wounded under their charge. The Medical Officers with other regiments were without any professional occupation at all, so far as the exigencies of the occasion were concerned.

It was the same while the army was encamped before Sebastopol;—so that, instead of increasing the number of



Regimental Medical Officers, as some wished, Staff Medical Officers, that could be rendered available for duty in any direction where their professional services might be most required, were decided to answer best the needs of the service. In like manner, general hospitals, available for the reception of troops of all regiments alike, were constantly on the increase while the siege lasted; although, at first, difficulties in organizing them were experienced, owing to the exclusive attention which had been paid to the regimental organization for many years previously.

Observation of the waste of time, and of the difficulties in administration, arising from so many of the Medical Officers belonging to particular regiments, led the principal Medical Officer with the expeditionary army in China, in 1860, as a first step, to get the sanction of the General Commanding for all Medical Officers of the army, Regimental as well as Staff Medical Officers, to be placed at his disposal alike; in fact, for the time being, to break up the regimental system; and the General Officer in command, knowing that the Chief of his Medical Staff must be the best judge of the medical necessities of his army, gave him the authority to remove and distribute the Regimental Medical Officers whenever and wherever he considered their services would be most advantageous, without reference to the commanding officers of their regiments, seeing that such references would entail too much delay. The results proved the wisdom of the arrangement. The minister for war was led to state in the House of Commons, that, the Medical arrangements of the expedition had been conducted with the most complete success, and that the health of the troops had been better attended to and preserved than they had ever been in any previous campaign. From the experience gained of the working of the two systems, regimental and general, Inspector General Dr. Muir was led to declare, in his official account of the China campaign, published in the 2nd vol. of the *Army Medical Reports*, that "though the regimental system might probably hold its ground for some time, still it must eventually give way to the more comprehensive and practical general hos-



pital system, as this last must always take precedence in time of war."

During the late New Zealand war it was found impossible to keep up the regimental hospital establishments at the places where the military operations were in progress. The equipment belonging by regulation to the regimental hospitals could not be carried—there were no means of transporting it. Inspector General Mouat, the principal Medical Officer, reported that the regulation regimental system of field hospital service was attempted to be carried out at first, but the difficulties met with were such as to show its utter inapplicability to a state of war. While the forces were near the South Road, ambulance cars were attached to regiments, and each regiment was furnished with its proper hospital stores, but it was found that a serious loss of efficiency followed. "Regiments left their sick at every station, but retained their field conveyance and equipment until they reached a part of the country where wheeled carriages could not be used. Thus ambulance conveyances were present where they were not wanted, and were liable to be absent where they were really required, viz., at the general hospitals along the line."

It was also soon found that hospital marquees, and hospital equipment generally, were useless encumbrances to the regiments while moving in the field. Corps on the march, and liable to move off from any halting place at an hour's notice, could not carry their sick with them; nor would it have been just to the sick to have taken them on under such circumstances. The sick were thus of necessity treated in small general field hospitals which were established at certain stations along the line of march; the regimental hospital stores were left behind, and the regiments disencumbered of them. "As it was," again to quote Inspector General Mouat's own words, "both inconvenience and loss occurred from an attempt to carry out what is in war a thoroughly inapplicable system—that of each regiment having a hospital of its own;" and in a subsequent part of his report Inspector General Mouat makes the remark (one



equally applicable to the China war of 1860), that "practically the regimental hospital system was in abeyance during the campaign." The duties of the Regimental Medical Officers were chiefly those of being present with their regiments on the occasion of action, applying primary dressings, and forwarding the wounded for treatment to the nearest general hospitals, and in attending to slight cases of illness and accidents on the line of march. All the grave cases of wounds and sickness were treated in the stationary, or general, hospitals. It was the same during the great war which not long since convulsed the United States of America; the regimental hospital system was at first tried; it failed in the same way, and very early in the war the general hospital system was adopted in its stead, as it is in the armies of all the great military nations of Europe. But if in war the system of each regiment having its own hospital completely breaks down, seeing that armies are only maintained for purposes of war, the question naturally arises, Can it be wise to keep up the system in time of peace, instead of familiarizing ourselves with, and trying to improve, the garrison or general hospital system, which *must* be resorted to in practice when war comes?

It is necessary for military purposes to subdivide divisions and brigades into regiments. Keeping up the individual designations and characters of regiments is also beneficial in various ways, as regards *the military service*. It excites emulation in discipline, and efficiency in time of peace, and causes rivalry in display of courage in time of war; but no analagous professional emulation can be excited, as regards *the medical service*, by a system which restricts observation to those only who are immediately concerned in the comparatively limited sphere of practice afforded under ordinary circumstances by a regimental hospital.

Such, then, on the one hand, are the necessities, deduced from actual experience, for the General *versus* the Regimental Hospital System on active service. On the other hand, the irregularity of conduct, the contamination resulting from excessive accumulations of sick and wounded, and the



other conditions which in former years caused general hospitals frequently to get the name of "general evils"—which caused them to be condemned by many whose memories are held by all of us in the highest estimation—have been proved not to be necessary accompaniments of the general hospital system. The system has been worked of late years in various armies, as well as by ourselves, without any such ill results. Let any one who cares to examine how far this is true, study the statistics of the general hospitals of the Northern armies of the United States during the late civil war. In 1865, Surgeon General Barnes wrote in his well known Circular, No. 6. "Never before, in the history of the world, was so vast a system of hospitals brought into existence in so short a time. Never before, in the history of the world, has the mortality in military hospitals been so small, and never have such establishments so completely escaped from diseases generated within their walls." Officers deputed by the governments of Russia and of Prussia, to observe the United States' hospital system, have given testimony to the same effect. The reports on the subject made by the officers deputed by the Prussian Government have, indeed, to all appearance, had a material influence on the important changes which the Prussian Government have made in the constitution of the medical service of the Prussian Army since the war in 1866. The evils which attended general hospitals in former years were the result of neglect of discipline, absence of application of the most rudimentary hygienic principles, of want of proper systemized supervision,—such mismanagement, indeed, as is hardly likely to recur in these days of general enlightenment and observation, without speedy and severe reproof. The state of a general hospital, like that of a regimental hospital, will be very much determined by the manner in which discipline is maintained, and its internal economy administered.

To the staff surgeons of the British service the change just made, of putting all medical officers on one and the same establishment, will have the advantage of rendering the rollster of service more fairly distributed. For some time



past, only a few months have elapsed before the staff surgeon, who has returned from foreign service, has found himself again at the head of the limited list of staff surgeons on home service, and therefore called upon to effect an exchange, or to start on foreign service again. It seems probable that this serious grievance to certain officers has acted as an incentive to amalgamating the officers of the department, with a view to putting all on a more even footing; but it is questionable whether this would have been sufficient to effect such a change, had it not happened that the regimental system of medical service had been demonstrated by experience to be unworkable in time of war, as well as, under the new circumstances of the British army, needlessly complicated and expensive in time of peace.

A great change of the kind I have been adverting to must be regarded with very different feelings by different members of the body in which the change is effected. Some years must elapse before its influence on individual interests passes away, and before, therefore, it can be regarded with perfect impartiality, and its merits be dispassionately weighed. For myself, I confess I look forward to its future consequences with much hope that they will be found highly advantageous to all concerned. I believe it will make the direction of Sir Galbraith Logan a most memorable one among the annals of our department. I do not merely look forward to the change as introducing a more economical system of medico-military service; as making the administration of the department more easy; as admitting more capability of improving its position and interests; as affording more opportunity for meeting particular circumstances which arise from time to time among its individual members, without prejudice to the interests of others; as removing the differences which have, to a certain extent, existed between the aims of individuals, and which have hitherto prevented Staff and Regimental Medical Officers uniting in concert to promote the common interests of their whole body; but, what appears to me still more important, I look forward to its becoming the means of fixing a more thorough feeling of professional character



throughout all ranks of Medical Officers; of making the object of each individual to be to acquire distinction in the scientific and learned corps to which he belongs, and so to lead to a common aim for sustaining the reputation of the whole professional body,—a reputation not merely restricted to the limits of our own departmental inclosure (as it must be admitted to be for the most part at present, when we remember the numbers composing our ranks), but holding a conspicuous place, as it ought to do, in the competition for distinction with which the great body of our profession outside the army is animated. I am well aware that Army Medical Officers are subjected to many conditions and circumstances unpropitious for keeping pace with professional advancement, and that they do not see before them the pecuniary and some other rewards which doubtless act as stimuli to the continued exertions made by their brethren in civil life; but these difficulties vanish when sufficient zeal exists, as any one may see who will refer to the records of what has been done, from time to time, by individual Army Surgeons.

The only scientific branch of the army which, in its combined military and civil professional relations, has any analogy with the medical branch, is that of the Royal Engineers. They have the special military application of the principles of their science just as we have; and they also are employed in a variety of works, as we are in our hospital duties, as common to civil as to military professional practice. Why do I make this remark? Not so much because of this resemblance, but rather on account of something in which we do not much resemble each other. When we look into the relations of the Royal Engineers with their profession as practised in civil life, we see many of them leaving the military ranks, and taking a distinguished part in great public works, and great scientific undertakings: relatively few of our body take such a conspicuous part among the civil pursuits of our profession. There are a few surgeons, whose names are household words amongst us, who, after years of honourable employ in military practice,



have taken eminent positions as metropolitan teachers, and have risen to occupy the chief positions in the colleges whose diplomas they obtained at starting in their professional career. But how few these are relatively to the numbers of those who have had the same opportunities as they had enjoyed! Need this be so? Perhaps, when we are united in one body, the spirit of professional emulation may, as I have surmised, grow among us, our reputation be proportionally extended, and we may be sought after, to fill some of the appointments which at present seem only open to our civil brethren. This will be a great boon to many on retiring from military service. We may be sure that the necessary *ability* already exists among our members, though, in many instances, in a latent state perhaps.

As I have alluded to a resemblance between ourselves and the Engineers of the Army, so far as both are partly employed in occupations common to civil and military life, I may just refer to another point of apparent analogy between us. It seems as if the Surgeons of the Army are destined to go through changes similar to some of those through which the Engineers have gone in their time. It was not till about a century ago that the Engineers formed a regular part of the army establishment; and they were then retained only as civilians, having various designations according to particular duties performed by them. Subsequently they received military titles, but only Relative or Honorary Army rank. A little before the beginning of the present century their military position was fully recognized; but until comparatively lately, about the time of the Crimean war, the corps consisted of officers only, like ourselves; the Sappers and Miners being a separate body attached to them, as the men of the Army Hospital Corps are attached, for certain duties, to the Medical Officers of the Army; and then it was, on this arrangement ceasing, that the whole were fused into one corps—the corps of the Royal Engineers. I do not imagine that the analogy will be made complete in our service, at any rate for many years to come. The successive changes which have been made during the last



ten years in the constitution and functions of the medico-military department of Prussia, have made the analogy quite applicable as regards the army of that country.

If this had been the opening day of one of our late sessions, when the benches before me were almost entirely occupied by candidates for commissions, I should hardly have touched upon the topics I have been discussing to-day. But, surrounded as I am by gentlemen the majority of whom have passed some years in the Army Medical Service, I may be excused for considering matters which are exciting particular attention in the department at the present time—matters on which they are competent from experience to form a judgement, and which will, moreover, probably exert a material influence on the future career of some of those who are now only entering its portals.

It has been one result of the reduced establishment of the medical department, that the Director General, with the concurrence of the Secretary of State for War (who considerately permitted the reduction to be effected gradually by absorption, instead of by transference to half-pay) has been enabled to allow a certain number of the officers of the department to use the laboratories and microscopic rooms of this establishment, and to take advantage of the other means of scientific improvement afforded by the Army Medical School. Want of accommodation has prevented this from being done, excepting to a most limited extent, when there have been many candidates for commissions attending the courses of instruction. It was, however, always contemplated that this should be one of the purposes of the School. An anonymous writer, whose object has seemed to be to do all in his power to disparage and injure the officers of the Army Medical Service, not long since referred to commissioned officers coming to the Army Medical School as being sent down to spend four pleasant months at Netley, with the sinister design of propping up an overgrown department. Taking the expression in a different sense from what the writer intended it, I hope that the four months spent by you at Netley will be pleasant months; and being



well assured, from the experience of what has been done by other officers who have previously come on the same errand, that the time will be *usefully* spent in extending information and professional knowledge, I have no doubt also that the officers sent will assist in *legitimately propping up our Department*, and adding to its importance. I don't know any better way in which the Department can be sustained than by our taking advantage of all opportunities of gaining experience and improving knowledge; or that there can be any wiser economy on the part of the State than to afford the opportunities for officers to do so. Mr. Guthrie—whose experience as an army surgeon in seven campaigns, as a surgical teacher for thirty years in a public hospital in London, as an examiner for more than twenty years, as twice President of the College of Surgeons, and as the holder of other prominent positions in public and private practice, entitles his opinion to have much weight—when he published his “Commentaries,” just before the outbreak of the Crimean War, wrote as follows:—“When the Court of Examiners of the Royal College of Surgeons of England confer their diploma, after examination, on a student, they do not consider him to have done more than laid the foundation of the knowledge which is to be afterwards acquired by long and patient observation. When a student in law is called to the bar, he is not supposed to be therefore qualified to be a Queen's Counsel, much less a Judge or a Chancellor. The young theologian, admitted into deacon's orders, is not supposed to be fitted for a Bishopric. When the young surgeon is sent, in the execution of his duties, to distant climes, where he has few and sometimes no opportunities of adding to the knowledge he had previously acquired, it is apt to be impaired; and he may return to England, after an absence of several years, less qualified perhaps than when he left it. To such persons a course of instruction is invaluable. It should be open to them, as public servants, gratuitously, and should be conveyed by persons appointed and paid by the Crown. Leave of absence for three months might be advan-



"tageously granted to officers in turns, for the purpose  
"of attending it."

The Medical Officers of the French Army have the privilege of attending at intervals the courses of instruction at the Army Medical School of the Val de Grâce at Paris—a much larger establishment than this, having fourteen Professors and Agrégés for the work, as circumstances admit of their being absent from other duties; and Surgeon-General Dr. Læffler, the Professor of Military Surgery at Berlin, mentioned last August, in a lecture on the anniversary of the opening of the Frederic Wilhelm Institute and Army Medico-Chirurgical School at Berlin, that the new Prussian Medical warrant of 1868 promised that provision should be made for Prussian Military Surgeons having facilities for participating in courses of practical military surgery every year.

We see then what has been thought on the subject in quarters where we may be sure it has been well considered.

When Dr. Læffler made mention of the Prussian warrant providing for annual courses of practical military surgery, he was particularly alluding to the practice of operative surgery; than which, as he remarked truly, no knowledge vanishes so easily, when not refreshed by practice. The opportunity of practising operations on the dead body is very important, especially in this country, where such difficulties and so much expense attend it; still, this study can be pursued elsewhere, and what therefore appears to me to be even more profitable objects of study here for officers of standing in the service, are the practical courses in the hygienic and microscopical departments. Officers who entered the service before the Army Medical School—the first of the kind in the country, and the only one at the present time fulfilling the same purposes—was instituted, had no opportunity of acquiring the knowledge which is now to be gained in these departments. It is quite true that the evils of overcrowding dwelling-places, and the necessity for fresh air, pure water, and other such requisites for the preservation of health, were well understood by medical officers and others, years and years ago; and had their advice, often tendered on these subjects, been followed, many lives might



have been saved; but a knowledge of these first principles of the science no longer suffices for the wants of our day. The sanitary science of to-day is no more the sanitary science of fifty years ago than the physiology and chemistry of to-day is the physiology or chemistry of fifty years ago. The hygienic demands now made upon medical officers frequently involve practical acquaintance with chemical processes in analysis, arithmetical calculations, and microscopical examinations, that were scarcely thought of till comparatively recent years, and a knowledge of which can only be attained by close and accurate study. I had a letter lately from a General Officer commanding on a distant foreign station, in which he complained seriously that none of the Medical Officers under his immediate command, from the principal Medical Officer downwards, had been able to make a satisfactory analysis of the bread issued to the troops. It was sour and disagreeable to the taste, and circumstances led to the belief that it was unwholesome. He complained he had great difficulty in getting any remedy effected, because the only information he could get to deal with from the Medical Officers consisted of surmises instead of precise statements of facts. I mention this instance merely as an example of what is now expected from Army Surgeons by Officers in command. Questions of a corresponding nature are constantly cropping up in different places, and, from want of means of getting them answered locally, are frequently referred here to the Hygienic Department of this Institution for reply. But if officers have not had the opportunities of devoting special attention to such subjects, how can the necessary replies be obtained from them? I need not dwell further on this topic. The very fact of many of you having volunteered to come here for purposes of study sufficiently proves how fully its importance is estimated among you.

In the course of my somewhat disconnected remarks, I have been led to speak of various changes affecting the concerns of the Army Medical Department and the Army Medical School. There is one other change which I must mention before I conclude—a change especially affecting our



interests here, and to which I cannot refer excepting in terms of much personal regret. I allude to the resignation and retirement of General Wilbraham, the Commandant of this station. The relations of the Army Medical School to the Commandant have been very peculiar. On the one hand, the location of the School in a building, and its connection with a great Hospital, under the military command of General Wilbraham; on the other hand, the constitution of the School, which invested its Senate, acting directly under the Secretary of State for War, with the discipline of the candidates, who are not commissioned officers, and, therefore, not yet subject to the Articles of War, placed all concerned in a position requiring much tact and discretion, to avoid infringing upon each other's responsibilities. Yet ever since the School was placed at Netley, a period coeval with the opening of Netley itself, and the assumption of the command by General Wilbraham, there has never existed a difference on any subject, or of any kind whatever, between General Wilbraham and the Professors or Senate of the School. General Wilbraham has always given the School the weight of his support, whenever it has been required. He has nearly every session attended the first meeting in this lecture room, and on such occasions has always addressed a few remarks to the new comers; and these addresses, coming from an officer holding so high and distinguished a position in the army, have no doubt tended, in a material degree, to the maintenance of that orderly and creditable conduct which, with very few exceptions indeed, have characterized the gentlemen who have passed through the fourteen sessions of the Army Medical School which have been held at Netley. It only remains for me, in the name of my colleagues, as well as on my own part, to acknowledge our obligations, and to tender our thanks, to General Wilbraham, for the valuable support he has so long and so invariably given us; and to assure him that it will not be forgotten by any of us, although circumstances have now broken the official ties by which we have for several years past been connected.



*W. J. Longman* *No 16*  
*with kind regards*  
*W. A.*

THE  
INFLUENCE OF HUMAN PROGRESS  
ON  
MEDICAL EDUCATION.

AN INTRODUCTORY LECTURE

DELIVERED AT

THE ROYAL VICTORIA HOSPITAL, NETLEY, ON COMMENCING  
THE TWENTY-FOURTH SESSION OF THE ARMY  
MEDICAL SCHOOL, APRIL 1, 1872.

BY

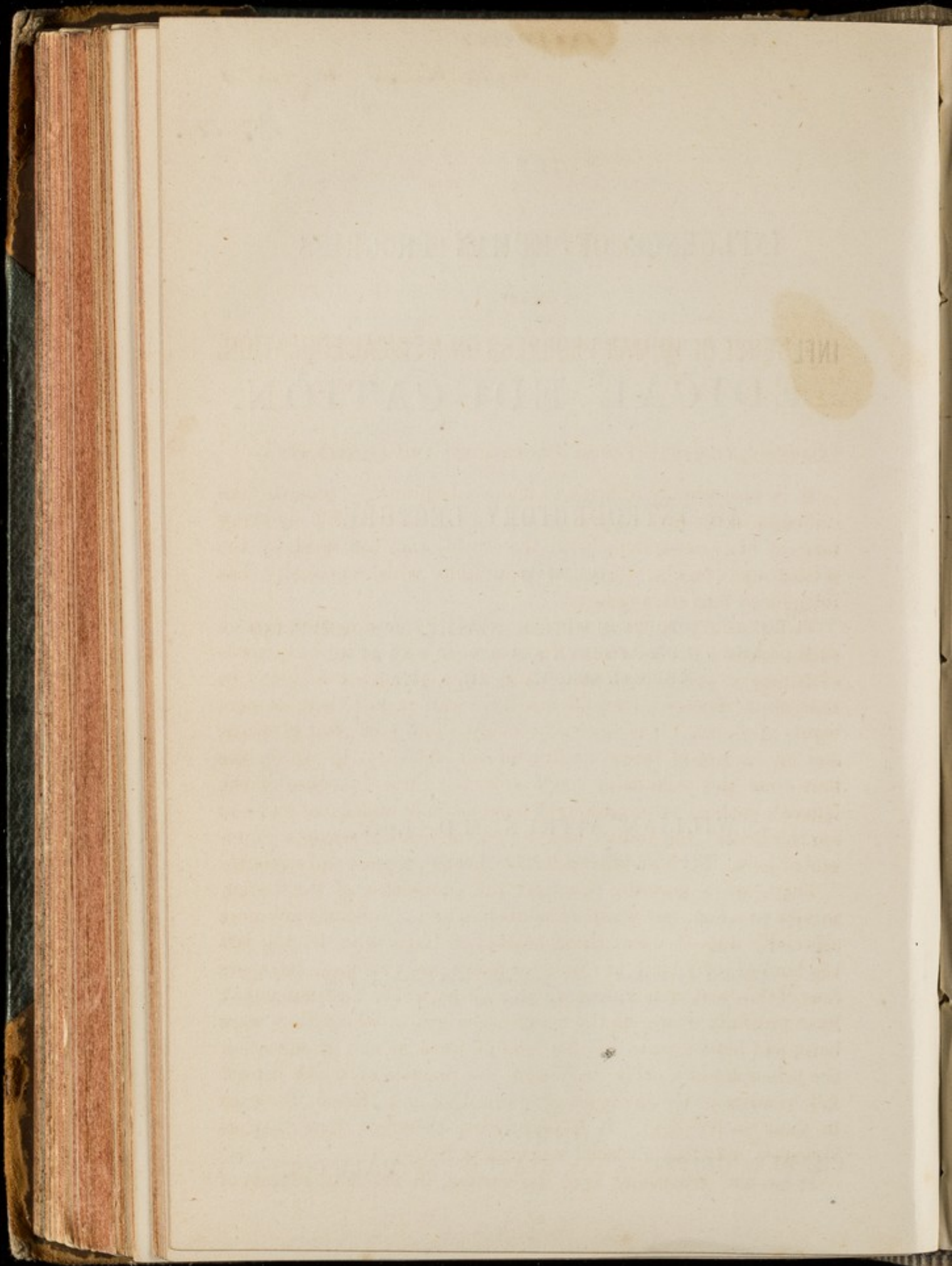
WILLIAM AITKEN, M.D., EDIN.,

PROFESSOR OF PATHOLOGY IN THE ARMY MEDICAL SCHOOL.

*[Printed by request; and published with permission of  
the Secretary of State for War.]*

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# LECTURE

ON THE

## INFLUENCE OF HUMAN PROGRESS ON MEDICAL EDUCATION.

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INSPECTOR-GENERAL INNES, PROFESSORS, AND GENTLEMEN,—

It is proverbially difficult to make a beginning. Indeed, "the difficulty of the first address on any new occasion is felt by every man in his transactions with the world, and confessed by the settled and regular forms of salutation which necessity has introduced into all languages."

Twice each year these seats are filled by new comers, and on such occasions it has become the custom to address to them words of salutation and of welcome. And although such words may be thus often repeated, I would not have you regard them as mere words of course. It is especially to-day a source of great pleasure, and an earnest of future usefulness and efficiency, to see for the first time the candidates for each of the three branches of the Queen's medical service brought together here under one roof—to see the British, the Indian, and the Naval medical services represented here. Such an amalgamation means progress and strength.

There are a few also amongst the candidates of the Indian service to whom our words of salutation and of welcome are more especially due—I mean those natives of India who, having left the land of their birth to reside for many years amongst strangers (one of the greatest sacrifices which a native of the East can make), have manfully overcome the many prejudices to which they were born, and have learned in this land of freedom and of education the principles of a noble profession, the practice of which cannot fail to advance the interests of civilization and Human Progress in their native land. It is our desire, therefore, that they, as strangers, may find a special welcome at Netley.

It has also sometimes been the custom, in the first address of



the session, to introduce the candidates to the nature of their duties, and to tell them of the high official trust and grave responsibilities which it will be their privilege to assume and their duty to discharge. But I do not now mean to trespass in these respects on the province of my colleagues, who will severally, as they meet you, introduce you to your respective duties, and define the special work you will be required to do here. I would rather engage your attention with a subject which I hope may be congenial to our first meeting together.

Casting about for some such topic, I have thought it might not be without interest if I attempt *to contrast the past with the present, so as to unfold the social conditions which have contributed to improve the education of medical men, and to advance the Science of Medicine,—conditions which will continue to demand and to exact of our profession still greater general and scientific acquirements*; or, more briefly stated, I would consider “*the influence of Human Progress on Medical Education.*”

Looking to the methods of instruction that have prevailed in our science, there are at least *three* which may be regarded as each characteristic of different periods of time. During the earliest period, the medical man was believed to be born a doctor. He was looked upon as a congenital physician—a physician by hereditary transmission. Hippocrates is an example. He is described as the seventeenth or nineteenth in lineal succession from Æsculapius, the reputed founder of the Science of Medicine. But the most recent instance of such a type of doctor is one whom Lady Mary Wortley Montague describes in her “*Letters from Italy*,” and who attended her in a dangerous illness. Of him she writes, “that he will not employ a surgeon or an apothecary. He performs surgical operations with great dexterity; and whatever compounds he gives, he makes in his own house, which are very few, the juice of herbs and water being commonly his sole prescriptions. He has very little learning, and professes to draw all his knowledge from experience, which he possesses perhaps in a greater degree than any other mortal, being the seventh doctor of his family in a direct line. His forefathers have all left journals and registers, solely for the use of their posterity, none of them having ever published anything; and he has recourse



on every difficult case to those manuscripts, of which the veracity at least is unquestionable." Now, without prejudice or disrespect to the memory of Æsculapius and Hippocrates, this stamp of a "doctor" has been improved off the face of the civilized world by the processes, no doubt, of education, of natural selection, and the struggle for existence.

The next period may be recognized as "the apprenticeship period," when men passed into the profession by a desultory kind of apprenticeship—nominally of seven years' duration—and then "walked the hospitals," picking up scraps of medical lore and practical knowledge as best they could. Such were the characteristics of medical education up to within sixty years ago. There was then no regular or uniform professional course of study in medicine, or indeed in any profession. In such a method of training, the practice went before theory; and there can be no question that many, following this plan, rose to high scientific positions and lucrative practices, whose names are now famous. Such will continue to be the case with whatever education: some will always rise superior in spite of adverse circumstances.

Up to 1822, and within fifty years ago, there was no such thing as clinical instruction in the education required for our profession. Clinical instruction, commencing in Edinburgh, extended thence to London, where the force of public opinion and competition among rival schools caused this method of teaching medicine and surgery to be first adopted with success by Elliotson, Watson, Brodie, and Earle,—names which are well known, and which will be ever held in high repute in the annals of medical education. Dissections of the human body were at the same time very rarely attempted; and it was not till 1832, when "the Anatomy Act" was passed, that such dissections were legalized. Natural history and botany were similarly neglected. Chemistry was but little studied; and practical instruction in it was far too expensive (even twenty years ago) for its being so learned, in a laboratory, by the generality of medical students.

The requirements for degrees in Medicine fifty years ago, were also greatly less in number than they are now; and, with the exception of Edinburgh, Glasgow, and Aberdeen, there was no University in this country where a complete course of medical instruction could be obtained capable of qualifying for graduation in that science, and where a degree in Medicine could be obtained.



One of our most illustrious poets—Thomas Campbell—(no doubt rejoicing in "*The Pleasures of Hope*") has the merit, in 1825, of proposing (in a letter to Lord Brougham) the institution of the London University, which now exacts the highest education in all branches of arts and science, and confers the highest university honours on men of all beliefs and of all sects.

The next and present period may be regarded as "the lecturing period," commencing in 1815, when the Society of Apothecaries instituted systematic courses of lectures upon chemistry, botany, anatomy and physiology, medicine and surgery—two or even three of these subjects being taught by one and the same lecturer. Now, any one of these subjects is found enough for one man to teach. Since that year, 1815, the time devoted to lectures has gradually increased; so that now, an everlasting attendance on *systematic courses* of lectures is demanded from the student. Every school, metropolitan or provincial, however small may be the hospital, must have a complete staff of lecturers. This is a condition of compulsory education which at present calls for rectification, and a reaction must inevitably take place; for, there is now too much lecturing, as opposed to tutorial instruction and hindering it, and of *compulsory attendance on systematic lectures*.

Nevertheless, a greatly improved and extended system of *practical* medical instruction in *tutorial classes* now obtains than heretofore. Practical anatomy, morbid anatomy, and pathology, are zealously prosecuted; natural history, botany, natural philosophy, or physics, and practical chemistry, are now necessary parts of medical education; but these latter branches of science ought to form part of elementary education, and thus be preliminary to purely professional study of every kind. They *must* come to be so when education pertaining to the daily work of life becomes more diffused in elementary schools. Clinical instruction is now universal as regards *schools*, but is not yet sufficiently universal as regards *students*. The courses of such clinical instruction require to be extended, so as to give a greater *length of time* to the tutorial instruction of individual students, and to embrace more of them, for longer periods, in the practical work. Apprenticeships have been practically abolished; the field of medical education has been greatly extended, and the subjects arranged in graduated stages of progress, with intermediate examinations from one stage to another; and the final one, to pass



for degrees and licences is now made as practical as possible by a bedside examination in surgery and medicine.

But while the *field* of medical education has been thus extended, and is still extending, the *time* for acquiring such professional instruction ought to be extended also. This will no doubt be done; and I would rejoice to see but one gateway to the profession, *in place of nineteen*—one central examining body—one examination, as uniform as possible, through which all must pass in order to receive a licence, simply qualifying for “general practice,” with as many teaching bodies as choose to establish themselves, or can find a reason for their existence, leaving university degrees and the honours of corporate bodies (which are a mystery to the general public) to be taken by those who desire to possess them, and who value them for what they may be worth.

What has led to these many and great improvements in Medical Education, by which you are presumed to have profited so much, compared with your predecessors of fifty years ago? These improvements are doubtless due to the irresistible and sure, but often imperceptible, march of Human Progress,\* and to the not less powerful influence of Public Opinion.

With the advance and improvement of *general education* throughout the country, the responsibilities of the medical man in Civil, Military, and Naval life have greatly increased, and are still increasing. The office of the Physician has been promoted. The aim of the Science of Medicine has been extended to the prevention as well as to the cure of disease; and the practice of the Art of Medicine has become greatly more difficult. But “difficulty is a condition of success—a severe instructor to wrestle with—which strengthens our minds and sharpens our skill. Such an antagonist becomes our helper, obliging us to acquire a more intimate acquaintance with our work and duty” (BURKE). The light of increasing knowledge has shown how many difficulties surround the science and the practice of our art, compelling us from time to time to reconsider in all their relations the aims and objects of the Science of Medicine. That science is now

\* “In every experimental science there is a tendency towards perfection. In every human being there is a wish to ameliorate his own condition.”—Macaulay, *History of England*, chap. iii. vol. i. p. 279.



found to require a better education, a greater compass and energy of mind for its efficient prosecution, than heretofore, because the Physician works in a much wider field. He also uses many more physical aids in detecting diseases and in determining their causes; and therefore he has more numerous and more delicate instruments and methods of investigation to learn the use of, than the Physician of fifty years ago. There never was a time when greater necessity existed than now for strengthening the judgment, by the discipline of a more lengthened clinical and practically technical instruction, in what will be the future daily duties of the "*general practitioner*" in civil life, and of "*the army and navy surgeon*."

Under the influence, then, of a better and of a greatly more extended field of education than men ever had when similarly situated, you commence here at Netley a life-long competition, in which the man who continues to educate himself, the best is sure to come to the front.

But if we take a still wider survey of our position, we cannot fail to perceive that these great changes, in relation to Medical Science and the education of the Physician, are only a few of the many changes which go to make up the sum of human advancement in the march of civilization.

The changes in the world at large which have come about during the past, and comparatively short period, of FIFTY YEARS have not been equalled in any other like period of the world's history. Scarcely a year of that time has passed without leaving its obvious and ineffaceable mark behind. It has been common to characterize such periods by certain epithets,—such, for example, that this century commenced a period of transition; and while it has markedly differed from the previous half century ending fifty years ago, it is reasonable to believe that the years to come will contrast advantageously with the years that are now passing away. I believe in no limit to the onward march of Human Progress in the coming time; not "*till charity itself shall fail, till tongues shall cease, and till all knowledge shall have vanished away*."

The blessings which the period of peace brought to Europe, from 1815 to 1853, are scarcely yet sufficiently appreciated, especially as to the influence of that period on civilization; and



the present generation seems almost to have forgotten the profound security which prevailed in Europe during the years which followed the end of the great French war. The improved social conditions of the present day, compared with those of the first part of the century, are mainly due to a series of events developed during these eight-and-thirty years of *peace*. The century, indeed, began with very great improvements—overcoming space and time—especially in the opening up of communications between different places and countries, which have placed the present state of European society in striking contrast with the past. In 1801, Parliament sanctioned the first railway bill; and the first railway in England was opened for traffic in 1827. Increased activity in road-making, bridge-making, tunnelling, and railway construction continued to mark the progress of the century. The first carriage road across the Alps was completed in 1806—one of the greatest engineering achievements during a period characterized by gigantic triumphs of engineering enterprise and skill; and in 1870 the making of that great road was eclipsed, at least in usefulness, by the cutting of a railway tunnel through the mountain itself—a work which took fourteen years to complete.

The application of steam to *ocean* navigation is another great and characteristic achievement of this period of peace—an application which has done more to facilitate communication between distant places than any other invention. By mighty ocean steamships the great railway systems of the Eastern and Western Hemispheres are now connected in one universal net-work.

In 1825 it was considered a great feat when a voyage was effected by a steamer from this country to Calcutta, *round the Cape*, in 113 days; and up to 1837 the most extensive application of steam to navigation was that maintained by Admiralty steamers between Falmouth and the Mediterranean, touching at Gibraltar, and proceeding to Malta, the Ionian Islands, and the ports of Syria. But in that year attention was called to the practicability and the advantage of establishing a line of steam communication between this country and the United States.\*

\* The question had been gravely discussed in the mechanical section of the British Association at Bristol in September, 1836; and it is very curious now to look back and read the conclusions arrived at on this subject only *thirty-six years ago*, and compare them with the results that have since been attained. It was then thought “*that in the state of the steam-engine, as applied to nautical purposes, a permanent and profitable communication between Great Britain and New York, by*



Two years afterwards (1838) the "British Queen," intended to convey goods and passengers to New York, only 275 feet long and 1860 tons register, was the largest steam-vessel in the world! Compare this with such a ship as the "Great Eastern" and with the class of ocean steam-vessels now building; and look to what Science has achieved in the direction of ocean steam navigation! Living, as we do here, within sight of Southampton—a town whose memories are associated with many a welcome greeting, and many a sad farewell—from whose magnificent docks the most stately ocean steamships go forth as ever sailed or steamed upon the sea, who will venture to put a limit to what may yet be done in the progress of ocean navigation?

This country, indeed, has the very greatest inducement to exertion in such enterprise; when it is remembered that England is the most central spot on the earth (HUMBOLDT),—that, from its central and insular position no place has derived so much advantage, or is so capable of deriving advantage from the application of steam, or any other motive agency, to ocean sailing vessels, as England, and no town is so advantageously situated as Southampton; which, in relation to other ports on the shores of the whole world, is perhaps the most central port on that great highway of nations—the Atlantic Ocean. It was reckoned a great deed when a voyage by steam was accomplished from England to India, round the Cape; then came the "Overland Route;" and now, engineering skill and commercial enterprise has opened up a canal through the Isthmus of Suez, thereby making the Mediterranean Sea, the Red Sea, the Arabian and Chinese Seas, the Indian and the Pacific Oceans one continuous and direct *fareway* to Hindostan, China, Japan, and Australia, and to the western ports of the Western Hemisphere.

Improvements and extension of the postal system are now notable all over the world; and systems of international telegraphy by sea and land have literally realized the imaginings of England's greatest poet, when he wrote,—“I'll put a girdle round about the earth in forty minutes.” Three hundred years ago that idea was

*steam-vessels making the voyage in one trip, must be regarded as in a high degree improbable!—that since the length of the voyage exceeds the present limits of steam power, it would be advisable to resolve it into the shortest practicable stages—say the most western shores of Britain, and the most eastern point of America!*—See *Transactions of British Association for 1836.*



but the airy fancy of "a Midsummer Night's Dream;" now the work has been accomplished, by which the history of the whole world is, day by day and hour by hour, brought before us by that electric telegraphy which first came into operation in 1836.

But, while fully recognizing the great mercantile facilities and mere commercial advantages which inevitably result from these various practical appliances of science to the daily work of life, there are other and far higher considerations which give them value, and which induce me to notice them as evidence of human progress—evidence of that tendency towards perfection influencing not only the education of our profession, but the amelioration of the condition of mankind.\* The more obvious results of these appliances have been, not only to increase the number of travellers, who are constantly augmenting, but to break down artificial distinctions which tend to separate one man from another, removing prejudices, dispelling ignorance, and so tending to bring together more closely the several nations of the world; while the tendency at the same time is to widen and extend the field of scientific inquiry and of enterprise in every direction, and to employ more individuals actively in scientific work. Every improvement in means of communication opens up new avenues to fame and fortune, speeds the intercourse between mind and mind, and creates new demands for knowledge. Hence the very great advances that have been made in every department of human knowledge during the past fifty years, under the influence of "*an education subservient to action*" (BACON). Hence, also, another characteristic feature of this age is apparent in the very great spread of education and of general knowledge which has

\* "In modern times the principal causes of the superiority of civilized men are to be found in inventions which, when once discovered, can never pass away, and the effects of which are in consequence in a great measure removed from the fluctuations of moral life. The causes which most disturbed or accelerated the normal progress of society in antiquity were the appearance of great men,—in modern times they have been the appearance of great inventions. Printing has secured the intellectual achievements of the past, and furnished a sure guarantee of future progress. Gunpowder and military machinery have rendered the triumph of barbarians impossible. Steam has united nations in the closest bonds. Innumerable mechanical contrivances have given a decisive preponderance to that industrial element which has coloured all the developments of our civilization. The leading characteristics of modern societies are in consequence marked out much more by the triumphs of inventive skill than by the sustained energy of moral causes."—*History of European Morals*, by W. E. H. Lecky, M.A., vol. i. p. 131.



taken place amongst the community at large; and the most distinctive work of the period has been to diffuse knowledge most widely among the middle classes, and necessarily amongst professional men.

Four great agencies may be recognized as having contributed to this diffusion, namely:—

(1.) The establishment of Mechanics' Institutions and Libraries throughout the country, as originated by Dr. Birkbeck in the beginning of the century.

(2.) The foundation of the London University in 1828.

(3.) The formation of the British Association for the advancement of science in 1831.

(4.) The institution in 1851 of International Exhibitions, bringing into friendly competition, in practical arts, the various nations of the world; and so leading up to those systems of industrial education inaugurated in this country and abroad by the late Prince Consort.

These agencies have given rise to a very marked and widely expressed desire for special practical instruction in the appliances of science—not to the exclusion of classical literature from our schools, but in order that the great facts of science and methods of investigation shall form *a part at least* of the regular curriculum of school instruction; and, that elementary instruction in science and in art should be introduced into all primary schools, so as to improve and render easier the *secondary education* of every man, in his special handicraft or profession. The fact, indeed, is becoming more and more obvious, that “a mind without scientific culture is a very partially educated mind—not half educated nor half prepared for the common purposes of modern life.”\* The inducements to learn have indeed extended in a ratio much more rapid than the means. The applications of science to the everyday work of life have so surrounded us with wonderful results, that *indifference* with many has at last become *inquiry*, and *self-interest* has become active where even *curiosity* was wont to slumber.

Hence the present period may be described as a period of *Education* and of *Competition*. *Of Education*, in the widest sense of the term, embracing not only mental training, but

\* Professor Allen Thomson's Address at Edinburgh, in 1871, to Members of the British Association, as President of the Physiological Section.



especially the all-important training of the hands and eyes, and, of the senses generally, in that technical knowledge and skill which must eventually measure or gauge either a man or a nation, and fix their relative values in the great market of the universe. *Of Competition* in every grade of life:—by it you have acquired the privilege of sitting in these seats; and by competition you will have to take your places in the remainder of that life-long race which you have still to run. The spirit of the age is indeed marked by the *keenness* of competition—which is making plain to all the advantages of education and of knowledge in the daily struggle for existence and for advancement. Twenty or thirty years ago the necessity of “educating the masses” (as the phrase went) was fiercely contested—now a necessity for a national education to embrace the very poorest classes is generally admitted, and has been legislated for. The aim of education now is—*first*, to make it practically applicable to the affairs of life; and, *secondly*, to enable the people to *continue the education of themselves*. Never before has such attention been paid, as now, to the theory and methods of education, from the days of Socrates to the days of School-Boards; and it is well known that a much larger proportion of the people, all over Europe, now read and write than formerly, while the means and habits of reading have greatly increased everywhere. Newspapers and periodical literature of all kinds have multiplied with a most prolific abundance, and the press—in philosophical and professional not less than in general literature—has become more powerful than ever as a medium of communication of thought and influence.\* The Commissioners appointed to inquire into the state of popular education in England have shown that since 1803, when the number of day scholars in the larger towns of the kingdom was estimated at

\* “A most momentous intellectual revolution is at present taking place in England. The ascendancy in literary and philosophical questions, which belonged to the writers of books, is manifestly passing, in a very great degree, to weekly and even daily papers, which have long been supreme in politics, and have begun within the last ten years systematically to treat ethical and philosophical questions. From their immense circulation, their incontestible ability, and the power they possess of continually reiterating their distinctive doctrines, from the impatience too of long and elaborate writings, which newspapers generate in the public, it has come to pass that these periodicals exercise probably a greater influence than any other productions of the day in forming the ways of thinking of ordinary educated Englishmen.”—*History of European Morals*, by W. E. H. LECKY, M.A., 1869, vol. i. p. 136.



1 in 17 or 18 of the population, the numbers instructed up to 1870 were as many as 1 in 5, and that 1 in  $6\frac{1}{2}$  were in average attendance. Such statistics show the great and steady progress which has been made since the early part of the century, both in the extent of provision made for the education of the poorer classes and in their appreciation of its value. In our days the children of the lowest ranks (*where education has reached them*) are in many points more highly educated than were those of independent people, and even of the nobles of the fourteenth and fifteenth centuries. But that is not saying much; for, with all that has yet been done, the educational means of the country are still very deficient, and reports of the examination of the scholars by H. M. Inspectors of Schools show that in no case do they rise beyond such an amount of education as is considered little better than practical ignorance amongst the middle classes. So deplorable, indeed, "is the state of elementary education that, with every desire to do so, it has been found impossible to give the working classes the instruction which they so much desire to receive, in the sciences connected with their work. They are not able to read with sufficient ease to master the books put before them, or to take any pleasure in reading. They cannot write well enough to make notes of what they hear or see; nor are they sufficiently familiar with arithmetic to make necessary calculations." Indeed, it is found practically that the great difficulty in promoting technical education is the want of primary fundamental training as the basis of scientific knowledge.\* Hence the general failure of Dr. Birkbeck's well meant institutions for the education of working men, which were quite an age before their time. Nevertheless, the numerous literary institutions and circulating libraries all over the country (although some of them come to an untimely end) testify to the spread of education, of reading, and of refinement; while there is obviously also an unprecedentedly increasing desire for more instruction among the middle classes of society—who have already made the greatest advances in knowledge, and who do most of the scientific work of the country.

Such spread of education has been regarded with mingled feelings of approval and disapproval; but it has not been found that it fuses or tends to level any one class with another,

\* Rushton, *Nature*, June 22, 1871, p. 143.



as some feared it would do. On the contrary, education must relatively raise every class, when it is still more universally diffused; and grades of culture must continue to exist as heretofore. The tune of education will come to be pitched at a higher key-note, but harmony will still prevail. The middle classes have so advanced already that a great chasm is interposed between them and the labouring population. That chasm is daily widening by the rapid progress in knowledge, in civilization, and in material well-being of the middle classes, while the actual labouring men tend to be left farther behind than they were before. The progress of education downwards must therefore tend to diminish this great chasm, and so restore a more harmonious grade in the culture of society. It will also enable the working man to profit from technical instruction. It will give more frequent opportunities for individuals to raise themselves out of the station in which they were born into higher ranks. Even now how often do we read of the sons of tradesmen becoming senior wranglers at English Universities, or taking the highest honours in science at the cosmopolitan Universities of Scotland or of London, qualifying themselves for the highest offices of the Church, the Bar, or the State—for Civil, Military, and Professional life? Practically, therefore, it may now be considered (since purchase in the Army and patronage in the Navy have been abolished) that the highest offices *in the world* are open to any one whose powers of intellect, strength of body, and opportunity for advancement may carry him onward in the race.

Such are a few evidences of Human Progress generally—examples of the tendency towards perfection in experimental science and amelioration of individual conditions during the past fifty years; and with these great advances of knowledge and education there has also come a proportionate increase of the power of Public Opinion—the most certain indication of health in the onward march of civilization.

But, you may ask, in what respect does this exposition concern you and the members of our profession? This rapid glance at Human Progress, during comparatively only a few years, shows that we, as a profession, must advance and keep pace with the time; for the strongest incentive to work exists in the spirit of



the times in which we live. Not only is knowledge power\* in these days, but the want of knowledge is practically a degradation. When science is not only rapidly extending her discoveries, but is revealing herself still more extensively to those classes in the community where she was unknown before, few will be content to live in the ignorance of their forefathers, more especially while the requirements of the age exact a wider range of knowledge from the individual members of every profession than formerly, and when education amongst the community generally is pitched at a much higher key-note.

The education of the medical man, whether he be destined for Civil, Military, or Naval life, must bear a relation, not only to the amount of professional knowledge he requires for his special work, but to the requirements and attainments of the existing state of society in Civil life, or of the society of the particular community among whom he is to work—such, for example, as that of the officers of the Army and the Navy in relation to you.

Two questions, therefore, at once suggest themselves for consideration, namely,—(1.) Has medical education and medical science kept pace with the diffusion of instruction and the progress of general education in the civil community, as well as with the preliminary and scientific training of other professions during the past fifty years? I venture to think it may fairly be said to have done so; but every energy is required to maintain our position, to keep pace with the progressive and rapid development of the other sciences, with the spread of education throughout the country, and the inevitable “tendency towards perfection of experimental sciences and amelioration of the individual condition.” While there is obviously now a very marked desire to give even the most elementary instruction a direct bearing on the actual concerns and work of life—while a special technical education in all kinds of work is called forth by the temper and feelings of this and other countries—Medical Education must be no exception in adapting itself to the requirements of the age in which we live. Medical Education is now called upon to possess the double characteristic of *comprehensiveness* and of *practical usefulness*—of comprehensiveness much greater than at any former time, and of practical usefulness in devising means for the prevention of diseases and the promotion of sanitary science.

\* “No doubt, the sovereignty of man lieth hid in knowledge.”—BACON.



The extension of physiological laboratories, as at Edinburgh (which in this country took the lead in this direction), and which are now in active work in University College, and King's College in London, will greatly contribute to this comprehensiveness and usefulness, by teaching exhaustive and systematic methods of exact research in questions of vital physics, somewhat similar to those carried on in the laboratories of Germany. At Guy's Hospital, Saint Thomas's Hospital, and Saint Bartholomew's, similar opportunities for work are in contemplation—the object being in all to afford more practical methods of teaching and learning methods of investigation concerned in the Science of Medicine. It is a new movement—one which is certain to make great progress; and it seems to me as the kind of work which rightly takes the place of an apprenticeship, and which will teach far more useful practical work than the best and most favourably situated apprentice ever learned.

It is by such technical education, in the application of all sciences, that advances are being made amongst all classes, in all professions, and in all directions. It is by the extension and the efficiency of such education that the place of this and other countries will be determined in the society of nations, by the triumphs of physical science, inventive skill, and industrial enterprise. Skilled labour and technical knowledge push forward and come to the front; unskilled labour and practical incapacity will inevitably\* be left behind, to idle out an unprofitable existence—which tends, in fact, to individual extermination.

As regards the profession of Medicine,—it is in the extension of clinical instruction in hospital wards, and in the extension of practical technical education, such as obtains in physiological laboratories, microscope rooms, and such like practical work *in connection with hospitals*—with *extension of time for work and study*—that future improvements in Medical Education must take place. But, at the same time, there is abundant evidence to show that Medical Science and Medical Education has advanced, and is advancing with the time. Especially it is to be noticed that there is more of exact diagnosis, and therefore more intelligent and efficient management of diseases; that there is a more intimate knowledge of the causes of some diseases, and therefore more

\* "It is as inevitable that Knowledge should have the supremacy over Ignorance, as that Day should come when the sun shines."



certain knowledge taught as to the means of their prevention; there are wider views taken of the principles of the Science of Medicine, and more direct and careful methods of investigation than at any former time. Our science, therefore, is advancing, and I believe it will continue to advance with a progress far beyond our present imperfect means of calculation.\*

Time, however, does not permit me *to name*, merely, the many improvements in Medical Science which have taken place during the past fifty years, or to state the relations in which they stand to other sciences. To *name* them merely would not give a fair representation of them. It would do our science an injustice, because they can only be fairly appreciated when regarded in relation to the whole Science of Medicine and to each other. The Medical Science of to-day is as widely different from that of fifty years ago as any science can be. Let it be sufficient to say that the detail of improvements in practical Medicine are very important and very numerous, even as they are set forth in our textbooks of Medicine.

But, while Medical Science has *not* been behind the advance of other sciences, and a review of the achievements of Medicine

\* On this point Mr. W. E. H. Lecky, in his most interesting and erudite *History of European Morals*, hazards the following forecaste, namely:—that “Of all the great branches of human knowledge, medicine is that in which the accomplished results are most obviously imperfect and provisional, in which the field of unrealized possibilities is most extensive, and from which, if the human mind were directed to it, as it has been during the past century to industrial inventions, and especially to overcoming space, the most splendid results might be expected. Our almost absolute ignorance of the cause of some of the fatal diseases, and the empirical nature of nearly all our best medical treatment, have been often recognized. The medicine of inhalation is still in its infancy, and yet it is by inhalation that Nature produces most of her diseases, and effects most of her cures. The medical powers of electricity, which of all known agencies bears most resemblance to life, are almost unexplored. The discovery of anæsthetics has, in our own day, opened out a field of inestimable importance, and the proved possibility, under certain physical conditions, of governing by external suggestions the whole current of the feelings and emotions, may possibly contribute yet further to the alleviation of suffering, and perhaps to that euthanasia which Bacon proposed to physicians as an end of their art. But in the eyes both of the philanthropist and of the philosopher the greatest of all results to be expected in this, or perhaps any other field, are, I conceive, to be looked for in the study of the relations between our physical and our moral natures. He who raises moral pathology to a science, expanding, systematizing, and applying many fragmentary observations that have been already made, will probably take a place among the master intellects of mankind” (vol. i. p. 166).



which have been made in living memory cannot fail to rouse a spirit of emulation in the most indifferent,—and while it must ever be held “as one of the glories of our profession, that all the great discoveries which have for their object the PREVENTION of disease, have been made by medical men,” we must, on the other hand, regard with feelings of deep regret, that the practical application of these important discoveries throughout the country lags very far behind, from no fault of the science of medicine, nor of the physician.

There has been more than a passive obstruction (which still prevails) to arrangements (suggested by knowledge), which aim at preserving health, by removing those influences from the vicinity of man which *artificially* curtail his life,—those external poisons which embitter and abridge his existence,—influences which bring about the greatest calamities of mortality, when opening buds are blighted, when life is cut off in the full bloom of usefulness, in the midst of happiness, affection, and esteem. These results of preventible disease, alike in the highest and in the lowest ranks of life, furnish the most desolate spots in human progress—standing out, waste and arid, in the midst of healthy enjoyment and usefulness, when the happiest prospects are defeated, and joy is engulfed in the deepest depths of sorrow.

It is the aim—it is not less the ambition—and it is in the power of the Science of Medicine to mitigate and to prevent such results; but ignorance, apathy, prejudice, and vested personal interests have hitherto stood in the way of that efficient legislation which alone can give the power to carry out the means of preventing disease amongst the civil population.\* For these reasons the

\* That the greatest apathy prevails, notwithstanding the recent parodied watchword, “*Sanitas sanitatum, omnia sanitas*,” was made notoriously manifest on the evening of Friday the 5th of April, during the debate in the House of Commons on the second reading of the Public Health Bill—“a measure involving the health and happiness, the moral and material prosperity of the nation.” The *Times* remarks on this occasion, that “a mere handful of members were thinly scattered over the ministerial benches, while the opposite side of the House looked still more deserted and forlorn.” This manifestation of apathy on the part of the legislature may also be taken fairly to represent the sentiment of the country. “It is idle to hope,” the *Times* continues, “that we can wage war with any measure of success against the forces of disease and death, unless the nation is inspired by a determined resolution to enforce Sanitary Reforms. Ministerial schemes for amending administrative machinery or for consolidating existing statutes, the



fruits of sanitary science seem to have been little in Civil life compared with what they have been in the Army and Navy. The reductions in the range of mortality among the troops at different stations during the past ten years, when compared with the two decennial periods embraced from 1817 to 1836, are almost incredible. In the Windward and Leeward Command, for example, from 1817 to 1836, the mortality ranged in different years between 43 and 169 per 1000 men. During the past ten years, the range has been reduced to between 5 and 29 per 1000 men. In Jamaica, the range of mortality, formerly between 61 and 307 per 1000 men, has been reduced to between 7 and 71. In Gibraltar, a range of between 8 and 128 per 1000 men, has been reduced to between 4 and 24.

The average death-rate also in places notoriously unhealthy has been greatly reduced during each decade of observation. Thus, Jamaica, from an average of 128 deaths per 1000, was brought down to 60, and now stands at 26 per 1000. St. Helena, from 25 per 1000, was reduced to 12, and now stands at 9 per 1000. Ceylon from 74 per 1000 was reduced to 38, and now stands at 24 per 1000. In India the improvements are simply marvellous.\* Surely in such examples we have sufficient evidence that disease may be prevented.

But, while it seems clear, that the medical man has to do, both

criticisms of Parliament, the warnings of science, are all inadequate to secure protection for the Public Health, unless by awakening the alarm and rivetting the attention of the community we can obtain the effectual co-operation of all in the arduous work. But what hopes can we entertain of thus arousing a healthy public spirit if the indifference of members to the vital importance of the questions discussed on Friday shadows forth the state of opinion prevailing among the constituencies? Must we then be content to acknowledge that all the admonitory events of last year,—the ravages of small-pox and scarlet fever, and the threatened approach of cholera, have been utterly without fruit? Certainly it appears that apathy has succeeded to panic, that the cold fit has followed the hot fit. Yet we hope this fatal torpor is but a passing symptom of reaction. All the warnings by which we ought to have profited are still legible in the records of the national health, and in the testimony of skilled inquirers. Let us hope that the debate on the second reading of Mr. Stansfeld's bill, tame and spiritless as it was, will bring them home once more to the public mind."—*Times*, April 8, 1872.

\* "Thirty-five years ago the mortality of the army amounted to at least three per cent. annually; on the average of the five years 1865-1869, it was under  $1\frac{3}{4}$  per cent.—to speak precisely it was 16.55 per 1000, as compared with 30 per 1000 twenty-five years ago."—Dr. T. G. Balfour, in *Journal of Statistical Society of London*, March, 1872.



in Civil and in Military life, with a class of minds much better educated than formerly; *yet*, as regards questions of State Medicine, and of Sanitary Science, and of the knowledge of their own bodies, the greatest ignorance still prevails amongst all ranks of life; and just as statesmen say that the franchise cannot be extended, and the representation of the people improved, till they are better educated, so sanitary improvements in Civil life, for the same reason, are likely to remain in abeyance, till primary education shall teach that some of the greatest social evils are traceable to physical agencies capable of removal by proper means.

Still further evidence of Medical Education being co-equal with the times is to be seen in the large class of "general practitioners" of Medicine, who by sound and extensive professional acquirements and general accomplishments, exercise a great and increasing influence all over the country; and another item of evidence exists in the rise of numerous provincial Schools of Medicine, which successfully compete with medical education in the metropolitan schools, as shown by the success of their pupils at pass examinations. While the "general practitioner" thus takes his place in civil life, and finds his level or asserts his influence, just in proportion to his scientific education, professional acquirements, social accomplishments and refinement, how is it likely to be with the military and naval medical officer?

This brings me to the second question, namely:—What are the relative acquirements of those with whom it will be your lot to associate in your daily life, and your duty to hold important and responsible professional intercourse in the services?

Although the military and naval systems of the country (and especially the officering of the Army and the Navy) are confessedly, at present, in a state of transition, it is not difficult to form an estimate of the relative educational acquirements of those who are likely to compose the Army and the Navy of the future.

That the work of the soldier and of the Army is "*skilled labour*" must be obvious to any one who will look into a little book called "*The Soldier's Pocket-Book*" (now in its second edition), written by Sir Garnet Wolsley—an experienced officer and distinguished soldier. We obtain from such a book a more elevated notion of the duties and work of a soldier than has hitherto been the popular idea of such work and duty—of the absolute need he has for individual education, and a knowledge of nearly every science and



trade. The progress of science, the extended and still extending use of scientific inventions, and of arms of extreme precision in modern warfare, necessitate a corresponding development of intelligence throughout all ranks of the Army and Navy, in order to derive corresponding benefit from these scientific inventions. The scientific knowledge of an officer now, therefore, implies a training far higher, more intellectual and practically professional than has hitherto been required in this country. A general education is required of him to begin with, at least equal to that of barristers and of medical men; besides the technical knowledge of his profession. Service in the Army or Navy as a commissioned officer being now also open by public and unrestrained competition to men of every class and rank of life, who are qualified by preliminary education and probational professional training to perform their duty, the military and naval officer must prove himself a man of education, if he desires to advance in either service; and the standard of general and professional attainments among officers must of necessity gradually raise itself, *even still higher than now*, by the spirit of emulation and of competition amongst those who enter the services. "The theory of the 'New Army Regulation Bill,' and of the changes proposed in officering the Army and the Navy implies that rank shall be proportionate to aptitude and intellectual capacity for duty, so that continual and more or less severe study must ever engage the attention of the British officer in both services, who looks to advancement in his profession." The profession of arms, whether on land or sea, as now understood and rightly followed, must be looked upon as one which tends not only to enlarge the intellect, but even to elevate the moral feelings. It is, indeed, a noble profession, to which the honour and safety of the nation is entrusted; and therefore it is justly believed that the more intellectual and moral force that can be accumulated in the services of the army and the navy, the more formidable must the trained physical force become. The more the individual intelligence of the officer is cultivated, whether soldier or sailor, the longer will the individual last; because with education he may learn to know better how to take care of himself and his men.

There can be no doubt, therefore, that the characteristic of the Army and Navy of the future, in every rank and arm of the service, is intended to be represented by "*an educated man*;" and the



medical officer of both services, in order to maintain his individual dignity and professional status, cannot afford to be behind or inferior in education and attainments to those with whom he must daily associate. The Rev. Canon Kingsley, in a recent address at the Royal Artillery Institution, Woolwich, expressed a similar belief as to the officer of the future—namely, “that the finest type of civilized man we are likely to see for some generations to come, will be produced by a combination of the truly military with the truly scientific man.”

From this imperfect glance around the educational and scientific horizon of the day, and looking to the position which the medical officer is destined to hold as a necessary element in the economy of an army and a fleet, officered by men of high educational attainments, it behoves you to qualify yourselves by every opportunity for gaining knowledge and technical skill so as to maintain your *status* in your respective services, with benefit to the country, with satisfaction to your superiors, and with credit to that profession to which you have the honour to belong.

It is to help *you* to do *this* that you find yourselves here. It is in accordance with the spirit of the times that *you* have come to *this* hospital and practical medical school to acquire a technical knowledge of your special duties in the Army and in the Navy; for your professional services will in future be valued, not so much by your skill in curing diseases, but in proportion as you know how to prevent men from becoming ill, and requiring to be cured. You will therefore acquire here a technical education in duties having for their object the prevention of disease, and the management of the medical affairs of armies and of fleets. In the acquisition of such instruction, your period of probation here will stand to you in the relation of an apprenticeship to your future work in the services. Such a course of instruction did not exist till within the past twelve years. It has arisen entirely out of the wants and necessities of the age; and if I have been successful in showing how the education of our profession has improved, is improving, and is still to be improved—if I have correctly indicated the social events which have contributed to these improvements—if I have fairly appreciated the cotemporary circumstances which, of necessity, are exacting, and will continue to exact, greater general and scientific acquirements from mem-



bers of our profession: then, I am sure I have laid before you sufficient inducements to work diligently—sufficient incentives to avail yourselves of the present opportunities for improvement—believing that the words written by an inspired writer\* more than 2500 years ago, are as true now as then: that *in wisdom and in knowledge shall be the stability of thy times.*

\* Isaiah xxxiii. 6.



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## INTRODUCTORY ADDRESS

ON

### THE OPENING OF THE TWENTY-SIXTH SESSION OF THE ARMY MEDICAL SCHOOL.\*

*Delivered at Netley, on April 2nd, 1873.*

BY

F. S. B. F. DE CHAUMONT, M.D., F.R.C.S.E., Surgeon-Major,  
Assistant-Professor of Hygiene.

GENTLEMEN,—On this the opening of the twenty-sixth session of the Army Medical School, I have been deputed to address to you the few formal words of welcome with which it has been the custom to usher in the work of the course. This I do most heartily in the name of my colleagues and in my own, and beg to express a hope that you may find both pleasure and profit from your sojourn here. This is now the fourth session since the establishment became truly an united service school, and since we first had the pleasure of addressing in this place candidates for the Medical Department of Her Majesty's Navy. For some years previously, we had formed a closer union with our Indian brethren; and, indeed, the very first session when the school was opened at Chatham, we had candidates for the Indian service, although their entry was afterwards for a time suspended during a period of uncertainty as to the future status of the Medical Department of our Eastern Empire. During this time, we have had none but pleasurable results from this happy bringing together of the members of the different services; and it is with the highest satisfaction that we welcome to-day the presence of commissioned officers of the Royal Navy, who are about to take advantage of the opportunity now for the first time afforded them, of going through the school course, and renewing their acquaintance with branches of study which have been less familiar to them during protracted foreign service, and under the pressure of the various functions entailed upon them by the exigencies of public duty. We have long had the pleasure of meeting here officers of both the Indian army and our own, who have come from time to time to rub off a little of the rust that must accumulate even on the most active minds, and we hope that these opportunities will continue to be embraced by all three services as far as they can be afforded. Indeed, we look upon this as a most important function that the school fulfils, as furnishing a place of study to which officers can return and acquire (like Antæus) fresh intellectual vigour by once again touching the ground from which they

\* Published by authority of the Secretary of State at War.



sprung. Our only regret is that our accommodation hitherto has been so limited—indeed, quite inadequate for the complete fulfilment of what is desired or wanted; and we can only hope that the time may come when the imperative nature of our wants may be appreciated, and our teaching be no longer hampered by deficiency of time and space. Still, however, we endeavour to make the best of what we have; and if at times we have to hurry up somewhat points in our teaching which might well repay more elaborate treatment, we have the reflection that a great part of the instruction is practical and so more valuable, even though it be brief, than mere oral instruction ever can be. This, in fact, has all along been the main feature of the school—to make, as far as possible, every man who studies at it go through every process himself, believing that an ounce of practice is worth a ton of theory. Of course, principles must be taught; but the principles of a practical science like ours are but little remembered, unless their concrete application accompanies the enunciation of the theory. On the whole, I may say, and I think justly, that we lecture our pupils as little as any school in existence, considering the multiplicity of subjects that we must necessarily bring before them. Some of our friends who have already gone through the school may smile at this, and think that after all they had quite enough of it. Well, lectures are essentially dreary things, and after one has passed already through some years of them elsewhere, they may appear a little irksome; but when you come to reflect on the question, you will, I think, find that we have pretty well reduced this part of the work to a minimum. Of theoretical lectures proper, we have only one a day for five days in the week, which gives in a session of sixteen or seventeen weeks only eighty to eighty-five lectures in all, in which to overtake the subjects of Military Surgery and Medicine, Pathology, and Hygiene. In addition to these, my colleague Dr. Macdonald has a short special course for our naval friends, in which to initiate them into the peculiarities of ships and their architecture, a mystery to us landmen. Whatever else there is in the way of lecturing, is really in the shape of such explanations and instructions as are necessary for conducting the practical courses of chemical analysis and microscopic examination, and clinical and pathological teaching in the wards and *post mortem* theatre. Many of the points brought before your notice will be new to all or most of you, and although some parts of the course may seem trite and well known to a few, yet no one will be the worse for going over a subject a second or even a third time; whilst the more intellectually gifted must exercise a friendly forbearance, and suffer gladly even a weariness of repetition, for their weaker brethren's sake. To all, however, even the most accomplished of students, there are opportunities for enlarging the boundaries of a knowledge which can never be too wide; there are means of making yourselves practically acquainted with various instruments, such as the ophthalmoscope, laryngoscope, sphygmograph, etc., which there is not always time during the studies in the civil schools for all to familiarise themselves with; there are opportunities for operation on the dead subject, which, in your capacities as surgeons of the public service, cannot be too frequently embraced; there are microscopes always at your disposal for any researches you choose to take up, and a chemical laboratory always open, to which we will gladly welcome you at any hour—from morn to dewy eve. We are glad to think that the impetus given here to original study and research has already borne good fruit, and that many of our former pupils are now prosecuting inquiries in different parts of the world—inquiries which have already brought forth



important results, and which give even greater promise of future productiveness. A certain stimulus is also given here to emulation, by the influence which the final examinations have in determining the place of a candidate on the general list, and by the record of our most successful competitors we keep here on our walls. Hitherto our Indian friends have had a monopoly of the first honours, the highest place having been invariably adjudged to one of their number when any candidates for that service have been at the school. I trust, however, it will be not long before a generous rivalry will enable one or other of the sister services to wrest the laurel from them. We have this year no candidates for the home army, and therefore the brunt of the battle must fall upon the navy, and our only wish is that the struggle may be a tough one, and that the best man may win. As regards the Herbert Prize, which has been for some years back awarded to the first man on the list of the military candidates, it was the wish of the Senate that it should be open to the naval service as well. It seems, however, that the terms of the original trust are considered by the legal advisers of the War Office to refer only to the military services, and thus, for the present at least, to exclude the naval.\*

In looking, gentlemen, at the career you have chosen for yourselves, a number of considerations present themselves, whether we view the profession of medicine as a whole or those particular branches of it to which you have signified your intention to devote yourselves, namely, the different services of the Crown. As regards the former, the selection of the profession itself, that is a point which your positions as already qualified practitioners show has been maturely weighed and decided upon, and which must now, in all but a few instances, determine your future lives. It, therefore, calls for but little remark of any but a general kind, yet I cannot help honestly congratulating you on the choice that you have made. Honourable as other professions may be, and more *honoured* as they certainly *are* in this world, there is none that I myself would have willingly embraced in preference; nay, more, I may state my belief, that there is none in which a man may, if he so wills it, keep his vessel of honour in more, I had almost said in as, unsullied purity. As long as ignorance prevails among the multitude, impostors will thrive and quacks grow fat upon its foolishness; but as long as we honestly work, taking scientific truth for our foundation, they need not vex our souls, and we may suffer fools gladly, seeing that we have at least the wisdom of patience and reverence for the truth.

As regards, however, your future position as officers of the public services, a good deal more may be said, as from this day forth you enter upon a new career and undertake duties which differ considerably, at least in form, from those which you have hitherto discharged. Your choice in this point also is, to a certain extent, a matter for congratulation. It is true that you cannot look forward to the high emoluments of successful civil practice; but it is to be remembered that such are only the prizes of the few, whilst, on the other hand, you will be spared much of the drudgery, anxiety, and uncertainty, not to mention the many annoyances and even humiliations, which too often fall to the lot of our hard-working and deserving brethren in general practice. The comforts of a fixed home can only be partially enjoyed by you, but after all the home is less the place than those who fill it, whilst the opportunities afforded to you of seeing men and countries are the fulfilment

\* This difficulty has since been removed; and the Herbert Prize is now open to all candidates, naval included, attending the school.



of what are merely the wild and unattainable dreams of the toiling worker at home. Indeed, many have been induced to enter the public service, particularly that of the navy, attracted by those very advantages of travel and scientific research which it procures. For my own part, however, my congratulations to those about to enter the navy must savour a little of hypocrisy, as I am one of those unfortunate individuals to whom a ship is simply poison, and I doubt if any amount of apprenticeship would have ever enabled me to overcome the inconveniences attending the perpetual search after my centre of gravity. This, however, is but a question of idiosyncrasy, and, fortunately for our country, not general; and, setting such individual inconveniences aside, we may say that the public service, both afloat and ashore, opens up a large field of inquiry both in professional matters and in the collateral sciences. It is to the medical officers of the army and navy that the solution and elucidation of some of the most important questions have been due, and in certain directions the opportunities enjoyed by them are unrivalled, dealing as they do with a body of men under more or less constant observation and control, whose histories, medical and otherwise, are known and can be traced through a considerable period. In this way it is possible to watch the effects of a special line of treatment and its results in a more complete manner than often falls to the lot of a civilian. Thus, to the medical officers of the navy is due the successful treatment of scurvy, which was formerly such a deadly foe to our sailors, and which unfortunately from time to time makes its appearance again wherever those wise principles laid down a century ago are neglected. To the medical officers of the army again we owe some of the severest blows given to the reckless antiphlogistic treatment once so general, and to them is due still more the final defeat of the even more reckless mercurialism which so long shattered the frames of its unfortunate victims.

In later times the responsibility for the health of a large body of men gave an impetus to the study of the laws of health; and the first course of hygiene proper ever delivered in this country was that begun in this school, and the first English work on the subject worthy of the name was the treatise by our distinguished professor, Dr. Parkes. I do not think I am claiming too much credit for the Army Medical School, when I say that the great and growing interest evinced on all sides on sanitary matters, and the foundation of chairs and lectureships on hygiene, have been largely due to the teaching given here, and to the way in which the efforts made to improve the health of both the army and the navy have awakened the attention of the public. It is true that we are still merely at the beginning of the matter; but a thing begun is half ended, and merely to have, we may say, codified the rules of health, which were previously scattered vaguely over medical minds and medical books, is of itself a great work; it furnishes a framework which may not, perhaps, be of itself eternal, but which may at least usefully support the rising edifice till increased knowledge and more exact science shall have filled up the weak places in the structure. The startling facts, first, that the mortality in the army, both at home and abroad, had been reduced by fully one-half in the short space of ten years; and, second, that there die in these islands at least 150,000 persons yearly from preventable diseases, have combined to strike even the Philistine mind that a great national crime was being committed so long as means were not taken to ascertain the causes of those diseases; and that, as Lord Palmerston wisely said, no amount of days of humiliation and prayer would avail unless our filthy alleys and noisome dens were first cleansed, and those causes, as far as we can find them out, swept away. We are



now beginning to see the result in the appointment all over the country of sanitary officers, whose special duty it will be to trace out the causes of preventable disease as completely as possible, and call upon the proper authorities to effect their removal. It is quite true that the measures are as yet very crude, and that in many cases the practical working of the system has been rendered useless by the perverseness of the Philistine mind already referred to ; but this we may consider as merely one of the phases through which every great movement has to go before its value can be sufficiently brought home to the average intellect. Much of it is due to the great ignorance of the class from which the local authorities are necessarily drawn—an ignorance, however, which is, we trust, becoming daily less, and will in due time so far cease out of the land as to let the imperative necessities of health be known, and even its money value appreciated, if no higher motive can be found to force its principles home.

Seeing, then, that the medical departments of the public services have exercised so powerful an influence on the community at large, it behoves us to consider well our position and its responsibilities. That the influence must be considerable is evident, if we take the mere numbers alone. The British and Indian armies and the Royal Navy do not muster fewer than 2,500 medical officers ; and the work done by such a body must be powerful for good or evil, both in the country which they are serving and in every other land in due proportion. The importance of this position has, however, hardly been as yet sufficiently estimated, for various reasons. In the first place, it is only lately that anything like a true bond of union has been formed between the three services ; and we hope that the fact of the candidates for those services having sat on the same benches here, studied the same subjects, and striven with each other in friendly rivalry, may have a great influence in this direction, not to mention the more intimate social relations and friendships formed by living together at the same mess, and uniting in field-sports and other means of relaxation in their leisure hours. Another cause which has operated to diminish the influence that otherwise might have been exercised, has been the regimental system in the army ; not that I desire to pronounce any sweeping condemnation of that system, which has many advantages, and has been productive of much good. I spent a number of years myself as assistant-surgeon in one of the most distinguished regiments in the service, and can look back upon the time spent there with happiness and pleasure, and I feel sure that the vast majority of men can speak of their old corps in similar terms. But the danger of the system seemed to me always to be, that the medical officer was liable to identify himself more with the regiment he served in than with the department to which he primarily belonged. This was simply reversing what ought to have been. He ought before all things to feel that he belongs first and foremost to the medical department of the service, and that his connection with the special corps he serves with is temporary and accidental. There was hardly the same source of danger in the navy, from the different arrangements prevailing ; a ship's company not being so separately defined a body, except during its actual commission, as a regiment, whilst the fact of the uniform remaining the same throughout was a continual reminder of the unity of the department. But in the army, where the medical officer wore the uniform of his corps, he was, I am afraid, apt to forget that the gay jacket of the Hussar or the elegant costume of the Rifleman was a mere accident of position, and noway an essential quality of his real status. In this way there was a want of unity as a medical body, and



on this account we may so far welcome the recently published Royal Warrant, in that it shadows forth the unification of the Army Medical Department, although it may otherwise fall short of what was desired or hoped. Had I been addressing candidates for the British Army Service, I should have taken this opportunity of saying a few words on the changes which the provisions of this Warrant (and the other accompanying documents) are about to usher in. For you, gentlemen, these can, however, have only an indirect interest, and therefore I think it unnecessary to dwell especially upon them. I would simply state my belief that the step taken is one of very great importance, and that it will ultimately lead to changes of vital nature—changes which must naturally follow the increase of influence of the Medical Department, and the slow but inevitable pressure of public opinion.

Now, gentlemen, in order that our influence, which, as I have said, must always be great, may be for good both to the service of the country and to our profession, as well as to the community at large, it becomes our duty to consider how we are best to discharge the various functions committed to our charge, and to use our utmost endeavour to carry this knowledge into successful practice. We must ever bear in mind that the end and object of our position, and, indeed, our very *raison d'être*, is war, and that but for its possibility (or rather we may say certainty) the services to which we belong would have no existence. Therefore, it ought always to be before our thoughts that it is for efficiency during that hour of war, which may or may not come to all of you, but which is sure in these times to fall to the lot of some, that we are retained and paid in time of peace. In everything that we do this great consideration should have a place, and no opportunity should be lost of adding to a knowledge which may be priceless in the hour of need. Neither should we presume too much upon previous success, for no amount of success will ever atone for subsequent failures. The greatest enemy of progress and true efficiency is that complacency of pride founded upon previous success, and it is a danger to which nations are as liable as individuals. It engenders a pernicious trust in traditions and an idea that what has been will be again. In this way the memories of Marathon and Salamis were undoubtedly the causes of the disaster of Syracuse; Rosbach and Leuthen led Prussia to the shame of Jena; whilst Jena and Austerlitz have in our own time brought forth the bitter fruit of Gravelotte and Sedan. It is safer far to remember our defeats than our victories; and our failures in the Crimea have proved of more lasting benefit than the brilliant and successful feats of arms which have added lustre to our name. No; success once achieved is done with, and ought to have no further influence, except to spur us on to fresh achievements, remembering the motto of Cæsar:

“Nil actum reputans si quid superesset agendum.”

Taking this, then, as the principle that should pervade our whole course of action, let us consider what is specially demanded from the army or navy medical officer. In a strictly professional point of view, he is called upon to be ready to act in any capacity. He may find himself (and in future probably more frequently still) the sole medical man with a corps, or in a ship, and must, therefore, be prepared to act with promptitude and energy under any circumstances. He is even in a more difficult position than a general practitioner at home, for the latter can generally have the benefit of the advice of some professional brother in unusual or difficult cases. But the military or naval practitioner has often no such resource, and he must be prepared to play the game off his own bat and take the consequences. In like manner, he is called



upon to perform a number of other duties besides the mere medical or surgical practice which is usually thought of as his proper vocation—for he must be his own sanitary officer, his own analyst, must superintend the record of meteorological and other observations, and generally discharge a multiplicity of functions which rarely, if ever, fall to the lot of a practitioner in civil life. It is true that those duties may be scamped or performed in a mere perfunctory manner; but we trust that a better spirit prevails, and that each will endeavour to do his share of the work to the best of his power; and it were well when a sense of responsibility may oppress you, or the absence of assistance tends to make you nervous, to remember a saying of Franklin's—"To be thrown upon one's own resources is to be cast into the very lap of fortune." There is one duty which our varied opportunities of observation demand from us, and which we are too liable, all of us, to neglect; and that is, to note and record for the general benefit those cases or points of scientific value which come before us. Procrastination and indolence too often fight against us here, and much is lost that might advance scientific knowledge. You cannot be too careful to cultivate the habit of observing accurately, a much more difficult thing than one would be inclined at first sight to imagine; and on this point the remarks of Sir John Herschel, in his *Preliminary Discourse on the Study of Natural Philosophy*, are of especial value. A habit also of noting down at once anything that strikes you as of importance is invaluable—for all notes are valuable in the ratio of their nearness in time of record to the fact recorded. However good the memory may be, the clearness of the recollection must get partially dimmed, and many apparently slight but really important touches lost, which may, perhaps, prove essential in the long run and their absence rob the whole record of its value. *Litera scripta manet* is a good motto for a worker in a scientific profession, but if memory be the only tablet, it too often proves to be written in water. Search also carefully for confirmatory evidence, and strive to cultivate the judicial mind, accustoming yourselves to weigh and estimate the value of each apparent fact or observation. In short, the precept of St. Paul, to "prove all things, hold fast that which is good," is one to be ever borne in mind; and by doing so we shall so far steer clear of the reproach which has attached to our profession of producing "more false facts than false theories." And it were wise also to apply this method of occasional verification even to the most time-honoured principles and apparent axioms. It is astonishing what hoary impostors may be thus sometimes unmasked. Be especially chary of giving too great value to mere hearsay evidence, or statements that have been obtained otherwise than at first hand. It is a well-known fact that if half-a-dozen persons see the same occurrence, and each be required to furnish an independent narrative thereof, we shall in all likelihood receive six totally different accounts. And yet none need be essentially false, but the power of estimating the value of each detail will vary, and one point will strike one man and another another, each consequently and unconsciously giving prominence to a part of the story that may not be in the least essential to the result. A slight acquaintance with the mathematical theory of probabilities is of importance as bringing out the bearing of this in a striking manner. All persons are not equal in their power of accurately transmitting the truth, not from any wilful or conscious falsehood, but from the natural imperfection of our organisation. Now, if a statement be transmitted through a succession of persons, the ultimate value of it will be represented by the product of the personal value of each individual. Thus, if we take a certain number of persons of very



high personal value in this direction, and say that each is capable of transmitting 99 per cent. of the truth, we shall find, even under such favourable circumstances, that we have after transmission through ten individuals only nine-tenths of the truth left, but after transmission through a hundred individuals there is little more than one-third left, and this is a greatly exaggerated estimate. What chance, then, has a tradition, handed down orally for ages, of containing any appreciable amount of the original truth?

In your position as sanitary and medical advisers to the officers commanding your regiments or ships, you have great and responsible duties to perform—duties which will demand both knowledge and judgment—for upon your advice so given, serious issues may often depend. If it be founded on erroneous opinions or insufficient knowledge, it may not only entail direct evil consequences, and compromise both yourself and the profession and department whose representatives you are, but it may also lead to your advice being disregarded and your opinion slighted on another occasion when both may be right. Of course, the best of us are liable to error, and some allowance must be made; but the error in most cases will be slight when an honest endeavour is made to reach the truth. And here, remembering the comparatively limited and certainly imperfect character of human knowledge, I would venture to warn you against too great dogmatism in your statements or advice; for it is, to say the least of it, embarrassing to be forced afterwards to retract an opinion enunciated with all the flourish of certainty and knowledge, when further researches prove its premisses to be false. Of course, dogmatism, like hypothesis, is necessary to a certain extent, and has its due place in all teaching; but a wise man who is open to learn by experience soon comes to distrust it and to eschew it as much as possible. On this point, the following remarks of a critical writer are apposite.

“The fact is that men, as they acquire depth and solidity of knowledge, find the original sharpness of the outlines gradually becoming softened or rubbed away by scepticism and thought. They find that, in a great measure, the clear distinct divisions and definitions which they have been taught by the instructors of their youth are not the eternal truths which they supposed them to be. That mind is not worth much which has not had occasion to readjust and alter a great deal of what was imparted to it, both in the physical and mental sciences, as certain truth—truth as certain as Algebra. A dogmatist is the best answerer of questions; and boys are generally dogmatists, not from an overweening conceit in their own judgments, but from a confiding reliance on the infallibility of their instructors.”

Now, gentlemen, it would be in the highest degree suicidal on my part to try to shake your confidence in your instructors at this early period of the session; but I bear in mind that I am not addressing a class of first year students, but a body of fully qualified medical men, who have passed, as we may say, the days of *veal*, and are capable of accepting in its true spirit the statement that we desire in our teaching to dogmatise as little as possible. Indeed, the numerous doubts and difficulties we have to lay before you will show that what I say is *de bonne foy*; and that we only hope to point the road on which you must hereafter travel, guided much by your own light—a light, however, which need not fail if the lamp be trimmed on the principles of true science. Progressive experience will bring these truths more and more home to you, and you will be able fully to appreciate the witty summing up of the



whole matter by Jerrold, who said that "*dogmatism* was merely *puppyism* arrived at maturity."

In your personal relations with the officers with whom you are hereafter to be associated, it should be your endeavour to keep up as much as possible the reputation for scientific knowledge which has fortunately often attached itself to the army or navy surgeon. But this will demand hereafter more continuous effort than heretofore. Formerly, the medical officer was almost the only one whose calling led him to study science at all, and therefore in this matter a very slight and superficial knowledge was often sufficient to place him in a position of importance and even pre-eminence. But now that the desire for scientific training is permeating all classes, and knowledge is so far increasing that some of my acquaintances, who are rather *laudatores temporis acti*, express their belief that the masses are too well educated, it is not a mere smattering that will suffice; and for a man to be considered really scientific, an amount of knowledge is required that would have almost set up a professor in times gone by. The increasing accuracy, too, of the hitherto less certain physical sciences renders their acquisition more and more difficult—one part in a million being now an appreciable and even large amount in chemistry—whilst the application of rigid mathematical demonstration is becoming daily more possible to branches of knowledge which were vague and visionary a few short years ago. For instance, I may cite the progress made in the measurement of muscular force and energy, the determination of the mechanical equivalent of food; and particularly the ingenious researches and calculations of the Rev. Professor Haughton on the law of least action in Nature. Not a decade passes but some new and practically illimitable field is opened up, so that even now a single branch of a science is more than can be mastered within the life-span of one man. Indeed, it is many years now since the story was told of a German mineralogist who devoted his life to carbonate of lime, and at its close expressed his regret that his studies had been so diffuse.

You will thus easily see that, if we are to hold our place as scientific men, we must not rest on our oars, but make continuous and ever increasing endeavours to keep up with the advance of the times, for which purpose the opportunity of a return to this school after a term of service ought to have the highest value; and we are glad to think that it is only the comparatively small space at our command here that limits the number of officers who avail themselves of it.

During your service you will frequently find much leisure time on your hands, and it will be for yourselves to decide how it is to be spent, much of your future success depending upon the decision to which you come; for this time is, properly speaking, not your own to idle or misuse. It is true that even Apollo does not always bend his bow, and that the mind demands relaxation; but still, even when that is fully allowed for, there is much time that calls for profitable use after the professional duties strictly demanded of you are finished. If every one stuck rigidly to his own special calling, and to that alone, I fear the progress of knowledge would be much slower than it is. We must remember that there is always a fresh generation growing up who are to come after us, and who will continually demand more and more to satisfy the increasing appetite and increasing capacity for knowledge. To this we may apply the beautiful lines of Lucretius:

"One race increases and another wanes,  
And in brief space the living pass away,  
And, like the runners in the games, hand on  
The torch of life to their successors. . . ."



But as in those very games the torch required to be alight and blazing, so must we see that the one we hand to our successors be not less bright than when it came to us. Allow me, therefore, to suggest the adoption of some one or more collateral pursuits on which you may profitably ring the changes from your strictly professional studies. In this way you will, in addition to other advantages, guard against a considerable danger—viz., professional bigotry and narrow-mindedness. Nothing so warps the mind as the habitual movement in a groove. This obtains in every profession and every science; and, to my mind, there never was a falsier word spoken than that which said:

"A little knowledge is a dangerous thing;  
Drink deep, or taste not the Pierian spring."

It is true, a man should drink deep of that knowledge which concerns his own particular calling; but, as regards other subjects, there is one thing that is more dangerous still, and that one is, no knowledge at all. Perhaps the danger of too close attention to one line of thought is nowhere better seen than among mathematicians: I do not mean the master minds of mathematics, who open up new countries in the science, but the ordinary average student of the science, who is often the victim of a singular credulity. I might cite examples of this; but I will merely point out that the matter has been well and ingeniously treated by the American writer, Edgar Allan Poe, in his curious story of the *Purloined Letter*, where the hero trusts to outwitting his opponent because he is a mathematician, and nothing more. Had he been both a poet and a mathematician, he would have failed. It may be easily understood that, though we may reduce some portions of it to rigid demonstration, it is hopeless to think of measuring the cosmos, when even in our own limited sphere we are compelled to introduce apparently impossible, and certainly incommensurable, quantities, in order to treat satisfactorily that which we may know. How, then, can we measure the infinite? It was for such reasons as these that the late philosopher, Sir William Hamilton, questioned the value of mathematical studies as an exercise for the mind; for he said, "A mind comes ill-trained for the hunting-field of probability by assiduous locomotion on the railroad of calculus and demonstration". Now, life is to us but a hunting-field of probability, and what is applicable to pure mathematical studies is, *mutatis mutandis*, applicable to other branches of knowledge. It behoves us, therefore, to make every effort to expand the mind and to enlarge our field of knowledge, knowing that for the healthy intellect a change of occupation is the truest rest. Hear what the eloquent author of *Friends in Council* says: "We are not here to promote incalculable quantities of law, physic, or manufactured goods, but to become men—not narrow pedants, but wide-seeing, mind-travelled men. Who are the men of history to be admired most? Those whom most things became; who could be weighty in debate, of much device in council, considerate in a sick room, genial at a feast, joyous at a festival, capable of discourse with many minds, large souled, not to be shrivelled up into any one form, fashion, or temperament."

And now, gentlemen, let me say, in conclusion, one thing, which may indeed seem superfluous. Knowledge is an excellent thing, but we shall fall far short of our great calling unless we cultivate, in addition, those high and chivalrous sentiments of truth and honour which go to make up the true gentleman. Ours is a noble profession, and in this sense let *noblesse oblige*. The old proverb says, "Manners makyth man"; but in regard of these we may agree with Lord Bacon, who

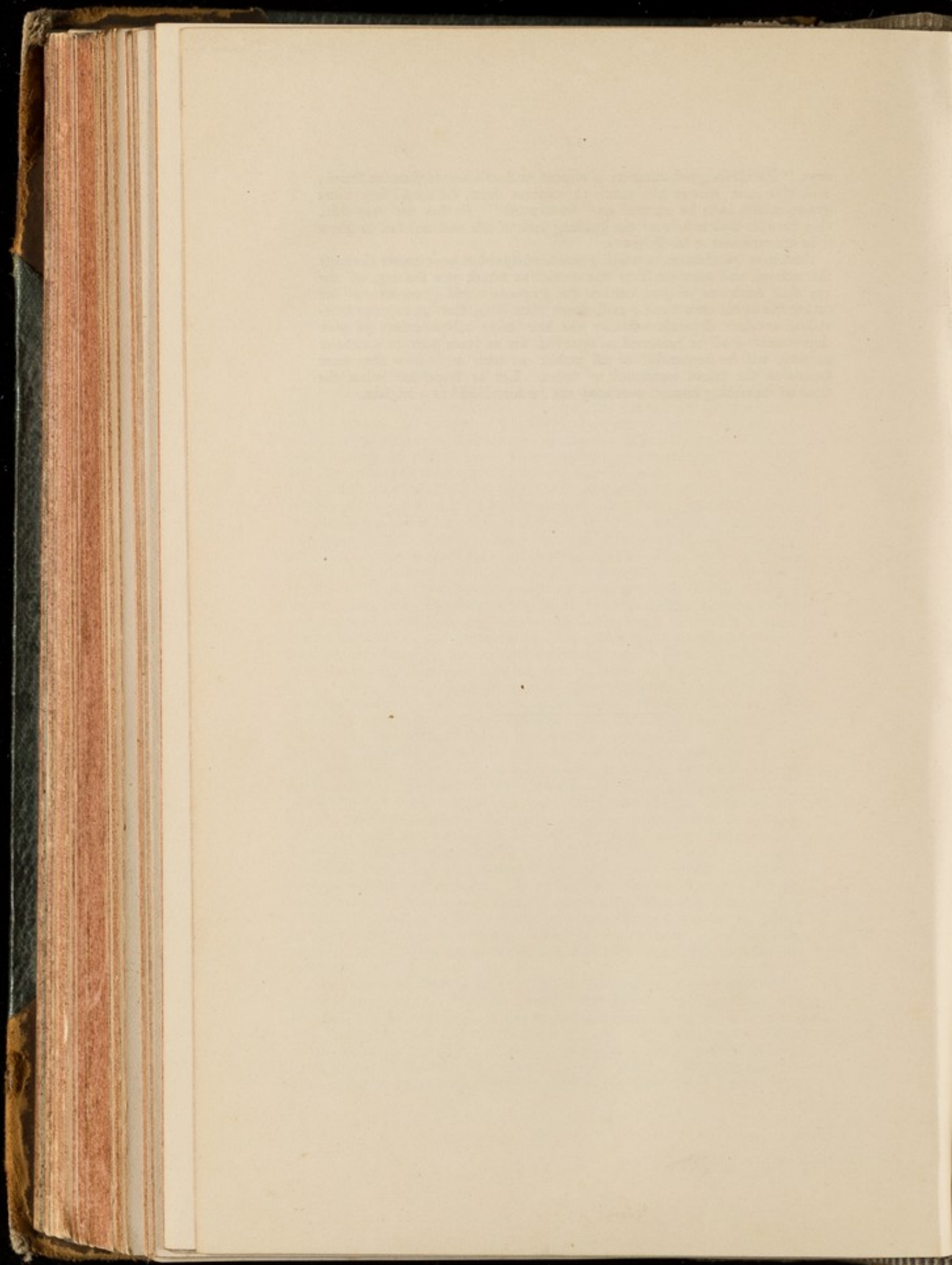


says, "To attain good manners it almost sufficeth not to despise them ; and, if a man labour too much to express them, he shall lose their grace, which is to be natural and unaffected." To this we may add, that he who makes honour the guiding rule of life will not fail to show it in his manners to his fellows.

And now, gentlemen, in wishing you God-speed in your career through this school, and afterwards in the service to which you belong, let me say that each one of you carries the happiness and prosperity of his future life in his own hand ; and, more than this, that upon your individual conduct depends whether the inevitable advancement of your department shall be hastened or retarded, for as years pass on a stricter account will be demanded of all public servants as to how they have bestowed the talent entrusted to them. Let us hope that when the time of reckoning comes, ours may not be found laid in a napkin.

---







à Monsieur  
Le Colonel d'Artillerie Nevens  
de de de  
Liège  
with T. Longmore's Compliments

No 10

ARMY MEDICAL SCHOOL MUSEUM.

DESCRIPTION

OF A

SERIES OF WATERCOLOUR DRAWINGS,

EXECUTED BY

THE LATE SIR CHARLES BELL,

ILLUSTRATIVE OF

WOUNDS RECEIVED AT THE BATTLE OF WATERLOO,

Presented by his Widow to the Army Medical School, together with a Sketch-book,  
Book of Manuscript Notes, and some Original Letters.

BY

DEPUTY INSPECTOR-GENERAL T. LONGMORE, C.B.,  
PROFESSOR OF MILITARY SURGERY.



*Handwritten notes in the top right corner, including the name "J. H. Thompson" and other illegible text.*

ARMY MEDICAL SCHOOL MUSEUM

DESCRIPTION

SERIES OF WATERCOLOR DRAWINGS

THE LATE SIR THOMAS BELL

WOUNDS RECEIVED AT THE BATTLE OF WATERLOO

These drawings are the property of the Army Medical School, and are not to be used for any other purpose without the permission of the authorities.

REPRODUCED BY THE ARMY MEDICAL SCHOOL

FOR THE PURPOSES OF THE MUSEUM



will like to pack

Transfer to  
10  
Photocall



Photo 211

10



Photograph please

Fig 9

only



Dublin  
June 27  
1860

Dear Longman -

I shall be  
at home whenever  
you like to come, &  
delighted to see you.

Let me hear  
a day before, and  
✓



will meet you: Alex. G. -

at Brighton I have given you  
from Mangan and  
a hearty welcome  
for you -

I cannot offer  
you a bet, but,  
will have one  
suggested for you

Dear yours

Perk. H.

Wm. L. G. L.

You will have  
nothing to do, but,  
visit the Museum  
and see what you



will like to pack  
up & transfer to  
Chatham — I  
think you will be  
pleased with the  
collection.



Arthur  
June 15<sup>th</sup>  
1860

Dear Longman,

I have received  
the official notification  
from the War Office  
relative to the  
Claims for Military  
Surgery in Ireland  
will please to be returned  
after the 30<sup>th</sup> inst.  
I have



accordingly written them in situ, and  
to Mr. Herbert) and of joining over them  
found a copy of with me; and the  
my letter to the D.S. you shall be  
supposing that before leave to come over  
any of the articles to Dublin for this  
in the Museum are purpose - I think  
packed up, you therefore that all  
I shall have the difficulties may be  
opportunity of examining removed, and I must  
not



say how happy I shall  
be to see you, & to  
give you my aid  
in my power —

Ever truly yours

Wm. L. Phelps



Note from W. A. Shaw, brother-in-law of S. C. Bell.

26th Nov? 1867

Dear Mr Longmore

Accept my best thanks for  
the copy of your "Description"  
of the Charles Bell's Wa-  
terloo Drawings forwarded  
to me by my sister Lady Bell.

The reading of it gave  
me very great pleasure. I  
may be allowed to say that  
by your comments, and selec-  
tion of extracts you show



distinctly that you have entered into the spirit with which the Drawings were executed. With an enthusiasm for teaching high Surgery, Sir Charles combined a keen sense of the dramatic and picturesque aspects of human nature; and the Drawings are, I think, evidences of a

broad-hearted feeling for mankind.

My Brother James - lately Principal Inspector Genl. of Hospitals at Madras - was with me when I received the brochure: & he will be much obliged if you will favour him with a copy. He regretted much that he did not see you when he paid a visit in September to Netley.



I should like much also  
to present a copy, for you,  
to the Library of our Hos-  
pital.

Lastly, if you can easily  
spare them, I would like to  
send three copies to members  
of Mr Charles' & my family  
who would be glad to possess  
them.

I am,  
Dear Sir,  
Yours very truly,  
Alex. Shaw



Note from Lady Bell, widow of Sir Charles Bell

47 Albany Street  
N. W.

Nov-27<sup>th</sup>  
(1867)

Dear Mr Longmore

I feel that in  
thanking you, I can  
express little of what  
I feel of thankfulness  
to you

When I remember  
the deep interest that  
Sir Charles had, in  
all that he did -  
and



see that you have taken up  
his works in the same  
spirit - you cannot  
wonder that I rejoice.

I cannot say what  
my Brothers may say  
to you on such a subject.

They have an  
enthusiasm of Love  
for his Memory

With every good wish,  
Believe me dear Sir  
Yours obliged & sincere  
Marion Bell

I wish to be remembered  
to Mr Otto - ? -  
who so kindly received  
me at Nelly Hooper



Presented to the  
Library of the  
Army Medical School Museum  
by the  
Hon. J. S. [illegible]

# ARMY MEDICAL SCHOOL MUSEUM

## DESCRIPTION

### SERIES OF WATERCOLOR DRAWINGS

THE EAST AND WEST INDIES

WORKS RECEIVED AT THE BATTLE OF WATERLOO

Presented to the Museum by the Hon. J. S. [illegible]  
Hon. J. S. [illegible]

ARMY MEDICAL SCHOOL MUSEUM

1860



## ARMY MEDICAL SCHOOL MUSEUM.

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DESCRIPTION of a Series of Watercolour Drawings, executed by the late Sir CHARLES BELL, illustrative of Wounds received at the Battle of Waterloo, presented by his Widow to the Army Medical School, together with a Sketch-book, Book of Manuscript Notes, and some Original Letters.

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By Deputy Inspector-General T. LONGMORE, C.B., Professor of Military Surgery.

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IN the summer of 1866, Lady Bell, the widow of the late Sir Charles Bell, F.R.S., presented to the Right Hon. the Secretary of State for War, for the Army Medical School, a series of seventeen large watercolour drawings, executed by her late husband. These drawings are all illustrative of wounds which had been received at the battle of Waterloo. The value of the present was greatly enhanced by the additional gift of the following two very interesting books, both of which had relation to, and served still further to explain, the drawings before mentioned, viz. :—

1. The sketch-book which Sir Charles made use of in 1815, at Brussels, containing the original sketches from which the large watercolour drawings were subsequently executed.

2. An interleaved copy of Sir Charles Bell's "Dissertations on Gunshot Wounds," which he carried with him to Brussels and used as a note-book. This book contains memoranda concerning most of the cases figured in the watercolour drawings.

Six interesting original letters, written from Brussels to Mr. Charles Bell during the months of August and September, 1815, and having reference to the progress of some of the cases depicted in the sketch-book, were also included in the present by Lady Bell. One of these letters is signed by J. Hennen, two by C. Collier, one by J. Boggie, one by H. Blackadder, and one by J. Roche—names of eminent military surgeons familiar to all who have studied the history of military surgery during the period of the Peninsular wars.

Lastly, the collection was rendered more complete from being accompanied by a descriptive catalogue of the cases forming the subjects of the drawings, as far as information concerning them could be obtained, arranged by Mr. Alexander Shaw, Surgeon of the Middlesex Hospital, and brother-in-law of Sir Charles Bell. The materials of this catalogue, as mentioned by Mr. Shaw, were obtained by him from several sources, viz. :—

1. Notes in pencil by Sir Charles himself, written on the margins of the original drawings in his sketch-book.

2. Letters from the surgeons who were subsequently in charge of the patients.



3. Notes written on the interleaved copy of the "Dissertations on Gunshot Wounds."

(These three sources have been before referred to as part of Lady Bell's present to the Army Medical School.)

4. Sir Charles Bell's work entitled "Surgical Observations," the first quarterly part of which was published in 1816.

5. A manuscript catalogue of the museum of the Royal College of Surgeons of Edinburgh, in which some of the cases which are the subjects of the drawings are referred to.

The histories of the cases, so far as they are noticed in the following account of the drawings, are abridged from Mr. Shaw's catalogue.

The value of these acquisitions to the Army Medical School, whether regarded simply as works of art, or in their relations to the history of military surgical science and practice, or as souvenirs of the handiwork of the distinguished author of the "Anatomy of Expression," can hardly be over-estimated.

It may perhaps be of service to make the nature and particular character of this gift to the Army Medical School generally known, and with this view I forward a somewhat detailed description of the several books and drawings above enumerated.

**SIR C. BELL'S SKETCH-BOOK.**—This is a folio book, 15 inches long by 10 inches in width; 46 pages are covered with pencilled sketches illustrative of 45 cases of wounds observed by Sir Charles Bell in the hospitals at Brussels, shortly after the battle of Waterloo.

On the first page of the book is a drawing of Shakespere's Cliff, Dover, with a note observing that he reached Dover early on the 28th of June, 1815. Mr. Shaw mentions that Sir Charles Bell's visit to the hospitals at Brussels extended from the morning of the 30th June to that of the 7th July, so that the majority of the patients from whom the drawings were made did not come under Sir Charles's observation till between the twelfth and nineteenth days after their wounds had been received.

The drawings in this book are generally outline sketches, slightly shaded, in black lead. The particular parts wounded, the situations where amputation has been performed, the parts swollen or inflamed, are coloured by the addition of red chalk. The 17 watercolour drawings have been selected from these 45 cases in the sketch-book. On the same pages of the sketch-book on which the drawings appear, are usually a few notes of the histories of the cases represented, the names of the hospital in which the patients were placed, and a few other such particulars. Occasionally there are memoranda concerning some special features in the symptoms or nature of the case which had attracted Sir C. Bell's attention. Now and then the sketch of the patient, and of the superficial appearances of his wound, are accompanied by a diagram showing the supposed injury inflicted in the deeper anatomical structures at the seat of injury. The memoranda noted are often very brief; as, for example, such a remark as the following:—"Remember the short cough and the sound of air spurting at the same time from the wound." Sometimes the drawings have evidently been made not so much to note the appearances of wounds of special interest, as to show some examples of injudicious surgery. An interesting instance of this appears on page 7 of the sketch-book. On this page is a drawing of a patient with an amputated thigh. The stump has a circular bandage round it; but no skin or flaps whatever have been left as a covering for the surface of the stump, the whole aspect of which is fully exposed to view. The patient is lying in bed with his back and head elevated, and the stump slightly bent upwards; he is pressing upon a compress over the site of the femoral artery near the groin, with the thumb of his left hand, while he supports the stump below with his right hand. Near the exposed face of the stump is a pad of charpie, marked A, which appears as if recently taken off from it. The following memoranda are inscribed on the page with this drawing:—"30th. A l'Hôpital de Gendarmerie. Bleeding; took off the dressing; bleeding stopped. This is a Frenchman; amputated on the field. The stump bleeding, it was necessary to open the wound; but it was open, and, under the rags, only this (A) clotted mass of charpie on the face of the stump. The wretched man understands a great deal: he keeps his thumb fixed on the compress over the artery; he says that the artery was tied, but 'qu'il est tombé.'



This is a venous hæmorrhage, from the veins being compressed. Here is an hospital mate, who says, 'Well, they cut them like a round of beef.' The limb is directly off, and the whole on the same level; the bone projecting; the skin not retracted. By-the-bye, the surface remarkably healthy, and in good state of granulation. Found this quite historical, for it is far behind," &c.

On the next page is the drawing of a patient who has had the radius and ulna of his left arm fractured by a bullet, which has afterwards coursed under the skin of the abdomen, and lodged in the hypogastric region. The left hand is shown to be greatly enlarged, and the notes state, "The hand swollen by the bandage around the broken arm."

Sometimes touches of character are noticed. Thus, in connection with a severe wound of the abdomen, with visceral protrusion, there is the remark, "A Frenchman, in great spirits, and of course in fine contrast with that pale Dutchman."

The sketches, however, of chief interest are those selected for representation in the more highly-finished watercolour drawings. Although the illustrations in the sketch-book are comparatively lightly finished, and bear the marks of the rapid, sketchy manner in which they were executed, they will repay a very careful examination. In each instance a consciousness of the faithfulness of the whole picture at once arrests the attention of an observer. The perfect knowledge of anatomy shown in the outlines—the natural positions in which the patients are lying, or the injured limbs reposing—the expression of the features, in many instances specially characteristic of the particular injury, or of the particular state of the patient in the case represented—show at once the accomplished surgeon and the master-hand of a thorough artist.

In addition to the surgical illustrations just mentioned, the sketch-book contains several plans and drawings of the ground on which the battle of Waterloo had been fought, and the appearance presented by it at the time of Sir Charles Bell's visit to Brussels. These drawings are taken from different points of view, and accompanied with numerous annotations written in pencil.

INTERLEAVED "DISSERTATION ON GUNSHOT WOUNDS."—The printed matter of this volume is identical with section xvii, "On Gunshot Wounds," of the second edition of Sir Charles Bell's "System of Operative Surgery, founded on the Basis of Anatomy," published in London in 1814, the year before the battle of Waterloo took place. Some copies of this section were struck off and published separately from the large work, the title and the numbering of the pages being alone changed, and this is one of them. The particular copy presented to the Army Medical School is plentifully interleaved, and many notes, written both in pencil and ink, are scattered through it; but a large proportion of the inserted pages are still blank. Although not so stated in writing, the internal evidence is quite sufficient to show that most of the notes contained in the book were written at the time the observations were made to which the notes refer, or very shortly afterwards. The notes are frequently dated, and often written in the present tense, thus:—"2nd July, Brussels. Let any man go into the hospital of —, and observe the manner in which the wounded are lying; he will be aware of the distracting difficulties the surgeon has to contend with, if there be no arrangement." "Tuesday, July 3, there were very many important cases; see sketches." "The wounded officers are very ill arranged. They ought to be together; if not in a house, in a street or quarter. But let me not be mistaken; it is of the first consequence that the patients should be dispersed," &c.

At the end of the book is a short and hurriedly written diary, in which notes are made of some of the most important operations performed by Sir C. Bell himself in the hospitals. These are illustrated by a few pen-and-ink sketches. One of the last entries in this diary is of particular interest, as regards the history of the case to which it refers; for the description given, though brief, agrees in all particulars with the history of the celebrated case of the French soldier whose thigh Mr. Guthrie successfully amputated at the hip-joint at Brussels, at 2 P.M. on the 7th of July, the day on which Sir Charles Bell left Brussels. The broken and separated head and neck of the femur belonging to the case in question is specimen No. 2,929 in the Pathological Museum of the



Army Medical Department at Netley. The entry in Sir C. Bell's note-book is the following:—"The last case I observed in this 'hôpital' was a wound in the groin, which shattered the head of the thigh bone. Here the shot entered" [a slight drawing follows, with a line pointing to the opening, which appears in the sketch to be just over the great trochanter], "and the head of the bone I discover to be fractured and separated from the shaft."

"My proposal is to extract the head of the bone, and do no more. Mr Guthrie's proposal is to amputate the thigh at the hip-joint. If the bone be taken out, there is a great cavity and suppuration certainly; but by this means the shock and violence will be saved. I fear the shock of so great an injury, especially as now the wound cannot be cut off, and its injury must be super-added to that of the incision. The man will readily allow of my proposal, but not of G.'s. However, next day he said that he would consent. In the meantime I was forced home by business. I had some officers to see," &c.

This note thus appears to show that Sir Charles Bell anticipated the present views with regard to the least unpromising plan of treatment for such an injury. The wound in the case in question was just that for the treatment of which resection of the head and neck of the femur would now be recommended by most surgeons, instead of the almost certainly fatal proceeding by amputation at the hip. Indeed, resection was actually and successfully performed in an almost exactly corresponding case in the Crimea, by Surgeon O'Leary of Her Majesty's 68th Regiment; and has since been done with success in four instances, during the late war in the United States, for wounds of a similar nature.\*

**THE WATERCOLOUR DRAWINGS.**—These drawings, seventeen in number, and life size, are painted on paper about two feet and a half long, by one foot ten inches in width, with slight variations. They were done by Sir C. Bell when he was appointed Professor of Surgery in the University of Edinburgh, in 1836, and were used as illustrations for his lectures. As before mentioned, they were selected and enlarged from the drawings of wounds in the sketch-book previously described.† They are all executed with remarkable freedom and vigour, and both their style and colouring cause them to be most effective at the distance at which such drawings are usually exhibited.

Most of the wounds represented are wounds by gunshot; some few are sabre wounds. They have been selected so as to illustrate wounds of each of the principal regions of the body, viz.: head, four; face, one cartoon, with two illustrations; neck, two; chest, one; abdomen, one; upper and lower extremities, eight; total, seventeen. The wounds are not exhibited in their most recent state, but in the condition in which they appeared between the twelfth and nineteenth days after they had been inflicted—after various consequences, local and general, had been induced.

A short notice of each of the cases illustrated follows. They are described seriatim, according to the regional distribution of the wounds, as well as in accordance with the numbers borne on the drawings themselves.

*Head (Drawing No. 1).*—Sabre wound. A portion of the skull at the vertex completely detached by the sabre-cut; the corresponding part of the scalp remains connected by a small isthmus. The original sketch is in page 2 of the sketch-book. On the same page is a drawing of the "piece of bone taken away," and a sketch of a skull, showing the position of the removed portion. There are also the following pencil notes on this page:—"Hôp. de la Gendarmerie, 5th July. This man was brought into the hospital insensible. None of the soldiers knew him; he only can tell that he belongs to the 1st Dragoons. This portion of bone was completely detached, and a quantity of matter between it and the dura mater." Another note on the same page says, "On being urged to speak, he makes painful efforts to speak, but cannot. He

\* See a "Tabular Statement of Excisions of the Head of the Femur for Gunshot Injury, &c.," Circular No. 6, War Department, Surgeon-General's Office, Washington, November 1865, page 62.

† Mr. Shaw mentions that "another set of copies from the original sketches, nearly the same in regard to the selection of the figures, but in comparison less carefully executed, were made some years before by Sir Charles Bell, on his appointment to be Lecturer on Surgery, in University College, London. This collection is still in the Museum of University College."



can sit up in a chair without support, but stoops languidly, and with a vacant and indifferent expression of countenance." There is an allusion to this case in the note-book:—"The next case was that of a sabre wound in the head, as seen in the sketch. I advised the isolated piece to be taken away, and the integuments to be preserved, which was done. He was considerably relieved in his symptoms the day after the operation, but still could give no account of himself." The fragment of bone above alluded to passed from Sir Charles Bell's Museum to the College of Surgeons of Edinburgh. (See Catalogue, div. cxvii, 5.)

This is one of the most striking of the series of illustrations. The dull and fatuous expression of the wretched young man's countenance, and the helpless condition to which he has been reduced by the effects of his wound, are most forcibly and painfully depicted in the drawing. Not a quality which one may presume he possessed as the dragoon soldier, physical or mental, remains, and the picture is distressing to gaze upon; yet Mr. Shaw mentions that he was told by Dr. Macleod, who attended this patient after Sir C. Bell's departure from Brussels, that the man ultimately recovered.

*Head (Drawing No. 2).*—Musket-ball wound. The case represented in this drawing forms a remarkable contrast with the preceding one. The patient was shot at the battle of Waterloo. He lay three days on the field without food, was then taken to a village, and from thence to one of the churches in Brussels. He was admitted into the Gendarmerie Hospital on the 30th of June. The ball entered the cranium in front, passed through part of the brain, lodged behind, and was extracted on the seventeenth day. The patient recovered within two months. The original sketch is on the third page of the sketch-book, which also has a sketch of a skull, showing the position of the wound of entrance, position of lodgement, and lines of fracture. The notes written in pencil, at different parts of the same page, are the following:—

"5 July. Hôp. de Gendarmerie. Domenic de Lorraine, 1 Reg. de Ligne. Bones fractured, and standing nearly perpendicularly. The ball, in its exit, struck up the skull; but the bones being resisted by the integuments, the ball rested within the skull. No symptoms of injury to the brain, no dilatation of pupils, no delirium. He is sulky, and complaining of headache; has not been sick; up a good deal, and can walk without support. Complains of being brought down to the operation room, insisting there was no occasion. I withdrew the ball from under the skull with the common dressing forceps. When the ball was shown to him, extracted from under the skull, he expressed satisfaction. Next day he was still well, and was walking about in the ward. Under Blackadder's care. Lindsay had a similar case. Durat had also a case of this kind."

At the end of the interleaved copy of the "Dissertation on Gunshot Wounds," used by Sir C. Bell as a note-book, some further memoranda concerning this case occur; and a full report of its subsequent progress, dated August 13, 1815, in the handwriting of Dr. Blackadder, is among the MS. papers.

In the drawing, the patient's features are compressed, and indicate a sulky, forced submission to what is going on. There is also an exhibition of some degree of pain. A passage in the note-book thus explains this expression:—"This man had not a symptom. He is quite intelligent. The sketch I made while he was sitting in the chair, he having walked down to the operation room. The expression of pain was not from what he suffered from the wound, nor from the surgeon either; but from the barber of the hospital, who was engaged with him at the time."

*Head (Drawing No. 3).*—Gunshot wound. A musket ball has perforated the frontal bone, entered the left orbit, and is causing protrusion of the eyeball on that side. The following notes appear with the original in the sketch-book:—

"June 31. Hôp. de l'Annunciata. Samuel Prichard, 4th Regt. Assistant-Surgeon Reid.

"He has no symptom; you see all. The ball entered here in the forehead. My probe passes three inches and a half, obliquely downwards, and towards the left temple. If I had remained I would have enlarged the wound in the forehead, and taken away the pieces of bone. I would have made an incision into the orbit, and extracted the ball, where I am sure it is lodged."



Among the collection of letters is one to Mr. Charles Bell from Mr. J. Roche, dated Brussels, 17th August, in which mention is made that "Sam. Prichard is alive, and doing well all things considered. . . . You will perhaps soon have an opportunity of seeing him in England, as he will, I believe, be soon sent home." The final result of the case does not appear.

The swollen and ecchymosed condition of the integuments covering the protruded eyeball are admirably shown in the drawing. There is no paralysis of the face, but the features wear a peculiarly heavy, torpid aspect.

*Head (Drawing No. 4).*—Gunshot fracture of skull. Fungus cerebri. The following are the marginal notes around the original drawing in the sketch-book :—

"Caserne Elizabeth, No. 16, sec. D. — Wanstell, 17th Regt. Staff-Surgeon Collyer's patient. On the fifth day after the battle was insensible. A portion of the frontal bone, an inch in diameter, was found driven into the brain, and it stood perpendicularly; not possible to extract it, from its being firmly wedged. Trepanning performed. Quite insensible during the operation; and showed no sensibility until on the next day, being bled, he shrank.

"On the removal of the bone a quantity of blood and brain came out, and coagulum was scooped out from betwixt the skull and dura mater. Three days after the operation he became more sensible, and has been improving. I recommended antimonial solution."

Note pointing to the fungus :—"Pulsating, sloughy."

The subsequent history of this patient, comprising an account of his death six days after Sir C. Bell had seen him, and of the appearances observed at the post-mortem examination, is given in one of the collections of letters, dated Bruxelles, August 5, 1815, from Mr. Collier to Mr. Charles Bell. In the drawing the fungus cerebri is very prominent; and the starting eyeballs, open lips, hectic flush of the cheeks, clenched hands, and general appearance, are strongly indicative of meningeal irritation.

*Face (Drawing No. 5).*—Two figures. (a) Gunshot wound; penetration of both orbits by a musket ball. (b) Gunshot wound; entrance of projectile over left malar bone.

There are no histories of these cases. The following notes are pencilled down in the sketch-book by the side of the original sketches :—

(a) "This through both eyes. This man has also lost the sense of smelling. Deprived of two senses—vision and smell."

(b) "Another case in the Gendarmerie. This man has lost the sense of smelling. The left eye has gutta serena."

*Neck (Drawing No. 6).*—Sword wound: penetration of the œsophagus. "Trois Louis Celestine. 21 de Ligne. Hôpital de la Gendarmerie, 2nd July. This man and another of the same name were stabbed with the small-swords of English officers."

"This wound is betwixt the sterno-cleido tendon, in the centre, and below the cricoid cartilage. The trachea may be wounded, but there is no air passing out. The œsophagus is evidently wounded, for almost the whole food passes this way, and the saliva keeps trickling." These are the notes attached to the original sketch in the sketch-book.

*Neck (Drawing No. 7).*—Deep perforating wound of the right lower half of the neck, from grapeshot. The following notes are pencilled with the original sketch, from which this drawing was made :—

"Elizabeth Caserne. No. 13, sec. D. James Alexander, 1st Regt. Rl. Dgs. Struck by a grapeshot; considerable bleeding on receiving the wound; since, several bleedings; the large cavity filled with coagulum, and the bandages soaked; stopped by cold applications; has been bled for pain in the chest, and relieved."

"There has been no bleeding from the wound for these three last days. The wound will admit the hand! The sterno-cleido, the scalenus, the trapezius, seen distinctly; the nerves also, but covered with slimy granulations. The beating of the carotid distinct in the wound, pumping up the matter. The right arm tumid and paralytic. I am asked how he is to proceed in event of returning hæmorrhage."

A line marking "exit of the ball" points to a wound a little above the right acromion.



The conclusion of this case is mentioned in one of the letters to Mr. Bell, dated Bruxelles, August 5, 1815, and signed Charles Collier. "James Alexander did not survive forty-eight hours after you saw him. I was quite prepared, in the event of hæmorrhage, to cut down upon and secure the bleeding vessels; but he died exhausted. He died as I have seen many, from the powers of life yielding to an injury they are unable to repair. He had no fever or cough."

In connexion with this case Sir Charles Bell has related the following anecdote of Baron Larrey:—"On looking over my sketches of the wounded at Waterloo with Baron Larrey, he fixed with interest on the case of a young man who had been wounded in the lower part of the neck. 'Well I know,' says this excellent surgeon, 'how that man must have died. I have seen many wounded so during my campaigns, and die from air drawn into the veins.'"

*Chest (Drawing No. 8).*—Extensive superficial wound of the chest by cannon shot. The marginal notes in the sketch-book give the following:—

"Albrecht Heifer. Caserne St. Elizabeth. No 13, sec. D. German Legion. The flesh of the right breast thus torn off by a cannon shot. The ribs not broken. No symptoms of much internal inflammation, but breathing with difficulty. Is this from lesion of muscles of respiration? I believe not, but from effusion." "Collier."

Mr. Collier alludes to this case in both his letters; in the second, dated 20th August, 1815, he writes, "Heifer, who had his breast struck by a round shot, is convalescent."

*Abdomen (Drawing No. 9).*—Sabre-wound. The colon protruded, and completely divided; its ends retracted from each other; omentum and meso-colon also protruded. The following account of this case occurs in the sketch-book:—

"Peltier, 3rd French Lancers. Belg. Hosp. 2nd July. Belly opened by a sabre. Immediately the bowels protruded. Before he was off the field he had two stools, and none since downwards. When brought into the hospital the third day after the battle, the mass was gangrenous (Dr. Kluyskens). A large portion of the mass comprehending the colon came away after he had made two openings."

Letters and lines indicate in the sketch the following parts of the protruded mass:—"A, superior orifice" (opening of distal part of colon); "B, superior orifice;" (proximal part of colon); C (pointing to the chief central part of the mass), "omentum covered with slough and slime;" D and E, (pointing to red, smooth, membranous portions on the front of the mass), "the other two red portions are portions of the gut which has sloughed away from A to B."

This is the patient before alluded to, whose spirits are contrasted with those of "that pale Dutchman."

There does not appear to be any further notice of this patient; but Mr. Shaw mentions that, "at lecture, Sir Charles Bell was wont to speak of the case as one in which recovery had either taken place, or might take place."

*Upper Extremity (Drawing No. 10).*—Gunshot wound of the right shoulder. The head of the humerus, and acromion process of the scapula, shattered. Excision of the head of the humerus attempted, but desisted from when the injury to the acromion was found, and amputation at the joint performed.

The drawing in the sketch-book not only shows the wounds of entrance and exit of the ball, but has the lines of the incision for the amputation marked in dotted lines. There is also a pen-and-ink sketch, in profile, of this patient, in the diary at the end of the interleaved note-book before described, with the remark, "Amputation of the arm at the articulation. I was forced to do this by circumstances." And a detailed account of the steps of the operation performed.

There is also some account of this case, illustrated with an engraving, Plate VI, in Sir C. Bell's work entitled "Surgical Observations," p. 231, under the head, "Observations on amputation at the shoulder-joint, and on excision of the head of the humerus in cases of gunshot fractures."

*Upper Extremity (Drawing No. 11).*—Head of left humerus shattered by gunshot at Waterloo. Head of the bone excised by transverse incision.

The original sketch from which this drawing was made is on paper, and has



been wafered on to one of the pages of the sketch-book. It was not done at Brussels, but at the York Hospital, Chelsea, after the excision had been performed. There are the following marginal notes :—

"James Ellard, private, 18th Hussars, æt. 32. A musket ball entered above the insertion of the pectoral muscle, passed through the head of the humerus, and went out behind. Few small pieces of bone were extracted a few days after at Brussels. On the 13th Sept. received into York Hospital, Chelsea. Operated on by Mr. Morell, on the 18th Sept."

The drawing appears to have been made on the fifth or sixth day after the operation. The shoulder appears swollen, red, and inflamed; and a transverse wound represents the line of incision made in the operation, which Sir C. Bell considered ought to have been longitudinal. A straight pencil line in the original sketch points to a swelling near the situation of the insertion of the pectoralis major, and "here abscess forming" is noted. The remaining notes are, "1st day, little fever; 2, feverish; 3, hectic flush; 5, an attack of ague." "2nd visit. The abscess discharged, contracted, healed. Three weeks since the operation. The man walking about the ward, with the arm little swelled or painful, and the countenance good. Successful."

This case is noted in the "Surgical Observations," p. 235. Full particulars of it are also published by Deputy Inspector-General Morell, the operator, in the 7th vol. of the "Medical and Chirurgical Transactions," p. 161. See also remarks at length upon Sir C. Bell's views in this case, by Mr. Guthrie, in his "Treatise on Gunshot Wounds," 3rd edit. 1827, p. 496, &c., with an engraving illustrative of the injury before amputation.

*Upper Extremity (Drawing No. 12).*—Necrosis of humerus, following fracture by gunshot at Waterloo.

The original sketch in this case is on page 43 of the sketch-book, and was made at the York Hospital on the 13th of December.

*Upper Extremity (Drawing No. 13).*—Left arm, with acromial end of the clavicle, and glenoid cavity of the scapula, carried off by cannon shot.

This is one of the early sketches in the sketch-book. The notes with the sketch are the following :—

"On the field, by howitzer shell; head of scapula, glenoid cavity, and part of clavicle. Artery taken up on the field. Eleven days, and no hæmorrhage. Wound healthy. This man will do well, with support, and due compression of the granulations."

In one of the letters from Brussels to Mr. Bell, dated Sept. 12, 1815, and signed "John Boggie," the recovery of this patient is thus referred to :—"The case which you saw in my division, of the shoulder torn off, is now nearly well. He left this a few days ago with the invalids. The acromium process, which had been left bare, dropped off about a month ago."

*Upper Extremity (Drawing No. 14).*—Arm carried off by cannon shot, close to the shoulder-joint. The following are among the marginal notes with the original sketch :—

"Serjeant Anthony Tuittmeyer, 2nd Line Batt. K.G.L. L'Hôpital des Jesuites. Taken off by cannon shot. The incision through the deltoides, down to the bone; and the saw used so as to leave the head in the cavity. This, with a little picking away of the bone, will make a good operation. Staff-Surgeon Hennen."

Plate VII, in Sir C. Bell's "Surgical Observations," is an engraving from this drawing. The following description is given :—

"He belonged to the German Legion, and a round shot carried off his arm on the field of Waterloo. In this condition, unsubdued, he rode upright into Brussels, fifteen miles, and presented himself to Dr. Bach at the Hospital of St. Elizabeth. When put into bed he fainted, and remained insensible for half an hour."

*Upper Extremity (Drawing No. 15).*—Right arm carried off close to the shoulder-joint by cannon shot.

This drawing is very similar to the preceding one. Among the marginal notes, with the original sketch, are :—

"Brunswick Hussars, 16th. A great deal of blood on the field; it stopped spontaneously. . . . This was amputated by taking the head out of the socket, and the artery tied. This very unnecessary."



*Upper Extremity (Drawing No. 16).*—Arm shattered from the elbow to the shoulder-joint. Incomplete amputation has been performed.

The patient from whom this drawing was taken made a very remarkable recovery from an attack of tetanus; and the history which is given in two of the letters of the collection is rather fully extracted, on account of the interest attached to the case, and because I have not been able to find it noticed in the writings of Hennen, Guthrie, Thomson, Ballingall, S. Cooper, or elsewhere. The following are the marginal notes with the original drawing in the sketch-book:—

“Caserne Elizabeth, 1st July. Voultz, King’s German Legion. Had his arm completely shattered from the elbow to the shoulder-joint; parts destroyed; no bleeding. On coming here, a kind of amputation was performed. Difficulty of securing the artery, by which a pint of arterial blood was lost. The wound was in a sloughy state; now clean. Being consulted, I advised that an incision should be made in the deltoid, in the length of the remaining shattered humerus; that the dissection should then be carried close to the bone; the light saw then used, to cut across the neck of the humerus, so as to leave the head of the bone in the joint. Collier. A, B, C, D, pieces of the humerus shattered, isolated, and sticking to the granulations by their outer surfaces. D is a remaining slough.”

Mr. Collier, in his first letter, dated Brussels, August 5, 1815, thus describes the progress of this case:—

“On Voultz, of the German Legion, I performed the operation we talked over, and, I add with gratification, successfully; *i.e.*, it now offers every prospect of a speedy cure. I cannot immediately recall whether, at the time you saw him, he had appearance of tetanic spasm; but prior to my undertaking anything, it was so confirmed that I deemed it necessary to call a consultation; and having then our opinion confirmed of its absolute necessity for any chance of life, I carried what had been before conned over into execution. I found no difficulty in dissecting the muscles from the bone, and very little in sawing it close to the head. With two incisions I removed all those splinters of bone which had been driven in among the muscles, and those portions of soft parts which appeared thickened and diseased. There was very little hæmorrhage, as the axillary artery was not touched; but the head in the socket was some impediment to the meeting of the flaps, and I now regretted that this had not been taken away. The spasm appeared neither augmented nor diminished by the operation. The countenance became strongly tetanic; jaws were fixed; the least effort to swallow produced the most frightful convulsion; his tongue, caught between his teeth, was sadly ulcerated. The emprosthotonos was succeeded by opisthotonos, and of as marked a character as I ever witnessed. When sitting on the side of his bed I have seen him thrown on his back, and the body arched by the power of the muscles; and yet through all this, and through some sloughing of the stump which occurred, he has struggled. He is now free, for some days, from spasm, which gradually subsided after three weeks. The stump is fast closing up, and he walks about the ward, and is considered a convalescent patient.

“P.S. There are but two cases living of all who had this affection—this man and a French officer. His death was constantly anticipated by all, and by none more than myself, on account of the general ill success of our means in these cases.”

In a second letter, dated August 20, Mr. Collier writes, “Voultz will soon be well. His health is good, and the spasm has long since yielded. The stump is nearly healed.”

*Lower Extremity (Drawing No. 17).*—Gunshot fracture of the leg in its lower third; the bones comminuted; the orifice small; general swelling of the limb. The limb is supported by a splint made of a bundle of straw.

With the original drawing in the sketch-book are the following pencil notes:—

“This is an example of the state in which I found a great many limbs in the Gendarmerie, three of which I amputated this morning. On forcing my finger into the wound, it is in a sac or bag, with jagged sharp bone all around; as quantity of bad matter spouting out after the finger.” There are also reference to these cases in the interleaved note-book.



The seventeen drawings, above described, have been protected by glass, and framed in oak frames, and are now hung upon the walls of the Pathological Museum of the Army Medical Department, at Netley. Mr. Shaw's catalogue is placed at hand for reference.

The sketch-book, interleaved copy of the "Dissertation on Gunshot Wounds," and the letters from the surgeons who had charge of the patients referred to in these works, after Sir Charles Bell had left Brussels, are placed together in an appropriate case in the same museum.

Look : —  
"Gentleman, I have the honor to acknowledge the receipt of your letter of the 11th inst. in relation to the above case. I have the honor to inform you that the same has been forwarded to the proper authorities for their consideration. I have the honor to be, Sir, your obedient servant, J. Shaw."

Mr. Collier, in the first letter, dated Brussels, August 25, 1815, thus describes the progress in this case : —

"On the 11th inst. of the 11th inst. I performed the operation we talked over, and I add with gratification, successfully : i.e. it now allows every appearance of a healthy state. I cannot immediately tell whether, at the time you saw him, he had appearance of tetanic spasm ; but prior to my undertaking any thing, it was so constant that I deemed it necessary to call a consultation ; and having then my opinion confirmed of its absolute necessity for any chance of life, I carried what had been before termed over into execution. I found it difficult to dissect the muscles from the bone, and very little in saving it close to the bone. With two incisions I removed all those portions of bone which had been driven in among the muscles and those portions of soft parts which appeared diseased and diseased. There was very little hemorrhage, as the external artery was not touched ; but the best in the world was seen in the bottom of the incision. I verified that this had not been taken away. The wound appeared neither augmented nor diminished by the operation. The wound was extremely painful ; but the patient was not the least effort to swallow, and the most tranquil conversation ; his legs were caught between his teeth, and he was able to walk. The conversation was not needed by opposition, and he marked a change as I was with him. When sitting on the side of his bed I have seen him throw on his back, and the legs stretched by the power of the muscles ; and yet through all this and throughout the sleeping of the night which occurred, he was tranquil. It is now that the some days from now, which gradually subsided after three weeks. The stump is fast closing up, and he walks about the ward, and is considered a convalescent patient."

"P.S. There are but two cases living of all who had this affection — this man and a French officer. This death was constantly anticipated by all, and by some more than myself, on account of the general ill success of our means in these cases."

In a second letter, dated August 29, Mr. Collier writes, "Voulez vous le voir ? Well. His health is good, and the spirit is as long since restored. The stump is nearly healed."

Lower extremity (Dissertation 76, 17) — Gunshot fracture of the leg in its lower third ; the bone comminuted ; the other small ; general swelling of the limb. The limb is supported by a splint made of a bundle of straw. With the original drawing in the sketch-book are the following pencil notes : —

"This is an example of the state in which I found a great many limbs in the Gentianine, three of which I amputated this morning. On forcing my finger into the wound, it is in a case or bag, with jagged sharp bone all around ; as quantity of bad matter spreading out after the finger. There are also references to these cases in the following pages."



No 19

# INTRODUCTORY ADDRESS

DELIVERED AT THE

Royal College of Surgeons in Ireland,

ON THE INAUGURATION OF THE

## MILITARY SURGERY CHAIR,

NOVEMBER 12TH, 1855,

BY

JOLLIFFE TUFNELL, F.R.C.S.I., M.R.I.A.

REGIUS PROFESSOR OF MILITARY SURGERY.

DEDICATED TO

THE MEDICAL OFFICERS OF THE BRITISH ARMY.

DUBLIN :

FANNIN & CO., 41, GRAFTON - STREET.

1855.







## INTRODUCTORY ADDRESS.

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MY LORDS, MR. PRESIDENT, AND GENTLEMEN,

The great drama now enacting at the seat of war is perhaps the noblest sight this world has ever yet exhibited. Great combinations have from time to time taken place for the purposes of conquest, but a combination for purposes so honourable has never before been seen. The armies of two great people, who had learnt face to face on the battle-field to view each other with respect, now fight side by side; and thus intimately ascertaining the good qualities of each other, this feeling of respect has been converted into enthusiastic admiration.

England and France now form one single army, and French and English soldiers tread the same path to glory. These two great nations have cast into the shade of oblivion all former jealousies, rivalships, and animosities, and have united for purposes generous and disinterested. Looking for no temporary profit or gain, or territorial enlargement, but seeking simply to establish the liberty of the world upon a solid and permanent foundation, each nation is making sacrifices of blood and treasure upon sound



political considerations. This union for freedom has not, however, been left to England and France alone; for gallant Sardinia has come forward, and, in the words of her noble monarch, "united her arms to those of powers who are struggling in the cause of justice, in behalf of civilization, and for the independence of nations." The special alliance between France and England is not a mere compact made between the two reigning Sovereigns, but a *bonâ fide* union of the people. The two nations have become united (and I trust *inseparably united*) by their soldiers' blood. The rancour and ill-will of ages has been washed away by those libations which have been poured out on the battle-fields of the Crimea, whilst in the presence of the whole world, at Paris, this alliance has been pledged by England's Queen; there, surrounded by the Royal Family of England, and holding by the hand its future King, she breathed the same in solemn silence to Napoleon's ashes. This was no simple deed of homage to the dead, but a noble act, attesting that past rivalry was indeed forgotten, and the union of the two people consummated.

An alliance of this nature must be fraught with high and holy consequences. Henceforth their objects will be in common merged in one. Examples of freedom, liberty, and power, France and Great Britain have constituted themselves a tribunal for the government of Europe. Europe has now a high court of appeal, an arbitrating power of becoming weight, an authority to which it may look up in the adjustment of all international questions. It has



been said that this view is not the correct one, and that the quarrel in which we are engaged is strictly England's own; that her Indian possessions are at stake, and that the shedding of the blood of her best and bravest sons is in her own defence. Granted that it is so, a war of self-defence must still be looked on in a hallowed light. The antecedent history of Russia tells but of conquest, with visions of universal supremacy filling the minds of all its monarchs; and surely the great mass of stores, the vast armament of war found aggregated in Sebastopol, would point significantly to aggression. The avowed object of Russia, I say, hitherto has been conquest, and what would have been the result of her triumph in the present case of Turkey? Why, it would have converted the future history of Europe into a dreary record of sanguinary struggles, followed by the silent slavery of each subjugated province, similar to that of Poland. The hostilities in which we are engaged have been reluctant ones; they were staved off until the very last, until endurance could endure no longer. War was *forced* on us, and not until necessitated to it did England exchange peace for war. War she well knew was but in one word "misery;" we cannot gild it, but may alleviate its horrors, and with this view and for this purpose are we met here to-day.

With the advent of war, the importance of the course of instruction which I have the honour to represent came to be duly recognised, and teaching, which includes the duties of the camp, the bivouac, and the



field, at once acquired its proper estimate. The importance of military surgery as a preliminary course of instruction for those educating for the public services of the country, now claimed the attention of the Government. The subject was brought before Parliament, and funds for the endowment of two chairs of Military Surgery in London and Dublin, similar to that which has long existed in Edinburgh, were voted by the House of Commons. Thus was this chair instituted; but the merit of the foundation, the origin of the measure, is due to Sir George Ballingall, and I feel I should be doing an injustice to him were I to omit, on this occasion, the opportunity of connecting his name with the institution of this chair. For years he strenuously contended for it wherever he could make his voice heard—for years he steadily used every effort to procure for London and Dublin the establishment of a Regius Professorship—to put these two schools on a level with Edinburgh, and to give to them the same advantages that his own University possessed. To place, I say, in each rival school what existed previously as an attraction to the student only in his own, shows a degree of liberality which deserves general commendation. The exertions of Sir George Ballingall for the English and Irish Colleges have not, I think, hitherto been as fully appreciated as they deserve; and he has, I consider, not received that meed of praise which I feel assured every member of this College will join in conferring on him, who reflects on the absence of self and the



disinterested motives that have characterised his actions throughout.

But before speaking further on the subject of the foundation of the Chair of Military Surgery in Ireland, I ought, perhaps, briefly to allude to the original institution of this chair in Scotland, since some whom I have the honour of addressing may not know the circumstances under which it was first established there, nor be aware to whose suggestions its primary institution belonged. It owes its

Since this Address was delivered SIR GEORGE BALLINGALL has died. The expressions of universal regret which his death have elicited, testify to the respect and esteem in which he was held.

the soldier. The Professorship in the impression on the public, as a specific branch of education; he connected it with his course of lectures on general surgery, and so conducted it in conjunction with them during the Peninsular Campaign.

Men instructed by him took with them to the field no knowledge calculated for the prevention, they went there only fitted for the cure, of disease, and such was the system of study when, upon Dr. Thompson's resignation in 1822, Sir George Ballingall succeeded to the chair. He found the course of pre-



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This office, upon its foundation, was first filled by Dr. Thompson (the author of the work on Inflammation), a man of the utmost talent and learning, but, raised by political influence from civil life to this appointment, he was totally unacquainted with the habits of the soldier. The Professorship in his hands made no impression on the public, as a specific branch of education; he connected it with his course of lectures on general surgery, and so conducted it in conjunction with them during the Peninsular Campaign.

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vious teaching had created in the minds of the profession and the public the most erroneous ideas relating to the real objects of the course. He found it regarded only as an enlarged and extended system of teaching of the treatment of gun-shot wounds—subjects already embraced in the lectures upon surgery in common.

Prejudice and misconception met him upon every side. He received no support whatever. The first year that he commenced his lectures, he delivered them to a class of four, and only four, students, but his other auditors compensated for this deficiency. They were medical officers of the public services, men who could appreciate the merits of the course, and they numbered thirty-three. It was, indeed, the countenance of those gentlemen that induced Sir George Ballingall to continue in office; and had it not been for their encouragement he would not have recommenced the succeeding year, such total apathy and indifference surrounded him on all sides. He, however, did recommence the course, and pupils and professors one by one dropped in from curiosity. They heard matters discussed and brought before them of which they were in total ignorance before; interest began to be excited, and prejudice correspondingly to decline. In four years from the date of Sir George Ballingall's succeeding to the chair, sentiments favourable to the course began to be generally expressed, and two years subsequently, when the regulations of the Royal College of Surgeons in Edinburgh came to be revised, and two courses of surgery to be required,



it was unanimously voted that those students who wished to do so might take a course of military surgery in lieu of one. Sir James M'Grigor, the late Director-General of the Army Medical Department, and Sir Wm. Burnett, the late Director-General of the Navy, now wrote expressing their regret that similar establishments did not exist in the other schools of the United Kingdom, and soon Sir George Ballingall had the satisfaction of seeing his class amount to no less than eighty-four; such was the change effected by his good teaching and steady perseverance.

Now here a selfish, or less single-minded person, would have let matters rest; Sir George did not. He next addressed a letter to Sir Robert Peel, who was then in office, urging the endowment of London and Dublin as well as Edinburgh. Having visited the Continent and the schools of instruction for army surgeons there, he well contrasted the liberal expenditure of the governments of Austria, Prussia, France, and Belgium, in providing for the public service, with that of England. He showed the remarkable differences which exist in the duties which devolve upon the surgeons of the Continental armies, and of our own; one set of men being engaged in treating the affections of their own climate, the other in combating disease throughout the world. His letter was well received, and attracted attention for the time; the seed was sown, but the then seeming security of peace prevented it from germinating, and from the year 1834 to the year 1846, no change took place, Edin-



burgh remaining the sole source from whence the student educating for the public services could derive any preliminary knowledge of the duties to devolve upon him. In this year, however, with the sanction of the late zealous and excellent head of the Army Medical Department, Sir James M'Grigor, I undertook the task of introducing into the School of Surgery in Ireland, this as a separate and special branch of medical education. The succeeding year the Directors-General of the Navy and Ordnance Medical Departments joined in recognising the course as equivalent to six months' surgery in the professional qualifications of candidates for admission into each respective service, and in the year 1852, the honourable the East India Board joined in giving it their unsolicited support.

Thus far the matter was entirely divested of Government interference, strictly so speaking. Now, however, the attention of Sir De Lacy Evans was attracted to the subject. As a soldier who had seen much service under trying circumstances, he was perfectly aware of its importance. He knew the onerous and varying duties that devolve upon the military surgeon in the field. He, I say, had seen service, and he knew the value of the knowledge sought to be diffused. He broached the subject in Parliament in 1853; his speech was well received by the House of Commons, and attentively listened to by the then Secretary-at-War, who immediately instituted an investigation into the working of this measure on the Continent, and the opinions enter-



tained of it at home. The strongest medical evidence was given in its favour, and military testimony spoke equally of its merits. Lord Cathcart, Commander of the Forces in North Britain, expressed his full concurrence with Sir De Lacy Evans, in the view he had taken, and stated it as his firm conviction, that extending to the other capitals of the United Kingdom the advantages enjoyed by Edinburgh, would be beneficial to the interests of the country, both in regard to economy of money, and, what was of more value, human life. Sir Howard Douglas, Sir Thomas Brisbane, Sir James Russell, and General Wetherall, all advocated the same view. This disinterested evidence was conclusive. War with Russia was declared, and the Government at once proposed a vote of £400 per annum for the endowment of additional Chairs of Military Surgery in London and Dublin, which passed the House of Commons without a dissentient voice. Such, gentlemen, has been the gradual progress of the subject we are met this day to consider: it originated with private individuals; it has terminated in the patronage of the crown.

The object sought by this branch of instruction is, to fit you, gentlemen, for the special duties which, as naval and military surgeons, you will be called upon to perform; for the object in instituting a medical establishment for an army or fleet is not merely to provide for the cure of disease, but it is also, and I may say principally, for the preservation of health, for the maintaining undiminished the vigour of our soldiers and seamen, under favourable and adverse



circumstances, in time of peace as well as in time of war.

The instructions with which I have been honoured by the Right Honourable the Minister for War, in connexion with the duties of this Chair, bear also directly on this point. They say—"You will treat, in your lectures, upon all such subjects as will directly meet the requirements of the army; you will explain the qualifications required in recruits; the various means of maintaining the health of soldiers, in barracks and cantonments, in camp and in the field. You will particularly explain the peculiarities which manifest themselves in the diseases and injuries to which soldiers and seamen are more particularly liable, and the best means of treating them. The diseases of foreign stations—the peculiarities these diseases present in these stations, and the most approved methods of treatment; the specialities of medicine; the arrangements necessary to be made previous to a march and to an action, and the specialities of surgery; the defects which unfit a soldier to serve, and warrant his being invalided; these, and all other matters which are not ordinarily taught in the medical schools of the United Kingdom. And no candidate for the Army Medical service will in future be admitted who has not satisfactorily passed through a course of such instruction by the Regius Professor of London, Edinburgh, or Dublin." It is the wish and desire of the Government that the education of those destined for the public medical services of the country should not only be as perfect as the resources of the



country have hitherto permitted, but that due provision should be made by the State for the deficiencies which existed before. The intention of the Chair of Military Surgery, therefore, is not only to teach you how to treat the soldier when wounded or sick, but it is also to bring before you the full and careful consideration of those measures which are best calculated for the prevention of illness and the maintenance of health. For, you are ever to bear in mind, that it is not the direct weapons of war—shot, shell, and musketry, that really thin our ranks, but that it is disease. This fact has been long ascertained; the experience of every campaign has proved it, and the present but too sadly bears it out, ten times the number of our gallant soldiers having sunk under disease than have fallen on the battle-field—but too truly verifying the words of the Czar after the battle of Inkermann—"that although our troops might baffle his generals that day, they would not be able to resist Generals January, February, and March."

The history of war, too, both by sea and land, shows further that more battles have been lost, more great enterprises failed, through sickness than through the skill or valour of the enemy. Our fleets and our armies are sent forth to maintain the honour of the British arms; sickness and disease may in a brief period paralyse their efforts, and these are not to be prevented by medicine or remedial agents. Medicine, as applied to war, consists in the preserving of the health of the community; the discovery of the causes of endemic and epidemic diseases; the dieting and



the clothing of the soldiers. These will be amongst the first subjects we shall have to consider—subjects totally apart from your general professional education, but subjects which will be henceforth taught in this College by the Military Surgery Chair.

Her Majesty's Government have decided on placing this chair in the Royal College of Surgeons in Ireland, because the position of this College as the national school of surgery of the country constitutes it the legitimate recipient of a royal and national appointment. The charter of the Royal College of Surgeons expressly states that this institution was founded in order—"that it might provide a sufficient number of properly qualified surgeons, as well for the service of the public as for our army and navy;" and the money with which the edifice was built, within whose walls we are assembled to-day, was granted by Government for this purpose.

And here I must be permitted for one moment to digress, for I feel that I should be slighting the memory of a great and good man were I to omit to tell you through whom this money was obtained. It was obtained by the late Dr. Renny, when Director-General of the Army Medical Department in Ireland, whose portrait, in grateful recollection of services rendered to the body, hangs in the board-room of this College, and a monument to his memory has been erected in Christ Church.

But to return. The College of Surgeons in Ireland is of a very different character from the College of Surgeons in England. The College of Surgeons of



this country is its great Medico-Chirurgical school; the College of Surgeons in England stands in relation to the body simply as a council-hall or guild. The examination of candidates for the diploma is held within its walls, but beyond this, and fixing the curriculum of study, it in no way assists in the education of its members. From the school of this College, on the contrary, issue the majority of those who have the honour of its diploma; and the student who gains it, believe me, carries with him into the world a title acknowledged and respected wherever civilization extends. For these reasons, then, the College of Surgeons has been selected as the most fitting locality for this chair. The Council, whilst accepting it as a graceful recognition of the high sense entertained by the Government for the worth of the institution, have not, on their part, failed to reciprocate by co-operating to the utmost of their power. No sooner was it intimated by the Minister-at-War that it was desirable that the Regius Professor should have the fullest means of illustrating his lectures, than the Council at once placed a museum at his disposal. Lord Panmure further expressed it as being the wish of the Government that full accommodation should be provided for the medical officers of the public services who might desire to prosecute anatomy whilst quartered at, or stopping in Dublin; a private dissecting-room was immediately ordered to be built, and is at this moment in progress of construction. The Government, it is true, have on their part come forward and granted money for the



fitting up of the dissecting-room and museum, but the College alone has charged itself with the cost of erection. These two, when fully furnished and completed, I do not hesitate to say, for their respective purposes, will not be surpassed in the United Kingdom; and I feel that I may here, on the part of the medical officers of each service, express their best thanks and acknowledgments to the Royal College of Surgeons. All will, on entering its portals, now feel, that, no matter whether Scotch or English surgeons, they are here as wholly welcome and at home as in the Colleges from whence they have taken their degrees. They will look upon it as a professional home—a common ground of re-union for all; and when quitting it for service abroad, the deficiencies in its museum, will not, I feel assured, be forgotten, but through their kindness will these deficiencies, year after year, be made less. Here (in connexion with a museum specially allocated to this chair) it may be said that I am speaking mainly with a view to self. I acknowledge, gentlemen, that I am; but believe me, in doing so, it is equally for you. Illustration is the key-stone of teaching. The ear may appreciate and retain, but it never can equal the eye. It would be invidious for me, on an occasion like the present, to particularize the names of some of the donors who have already contributed, when, from the very number, I cannot name all; therefore I can only say that I must beg most gratefully to express my thanks to all who have already aided in the formation of this museum, and especially for the kind



and liberal manner in which they have come forward to do so.

My duty, then, in connexion with this chair, will be, to bring before you the full and careful consideration of those subjects which it is necessary that you should be acquainted with, in order to fit you for the charge of large bodies of men; and the experience of the present war has, I think, sufficiently shown the necessity of such being a branch of the education of every military surgeon—indeed, I might almost add, of every military officer; for if it were inculcated that the object to be attained in war was not only fighting and destroying the enemy, but also preserving our own troops in efficiency as to health, a vast deal of the loss of life in armies would be avoided.

There has, unfortunately for the welfare of the English army, been, from time immemorial, a general dislike to receive medical advice. I do not mean to say that exceptions have not existed to this rule, but it is (as expressed by the Scutari Commissioners, in their report) “notorious that the most valuable suggestions of the medical officers were but too frequently termed ‘Doctors’ crotchets,’ and utterly disregarded.” Everywhere it was the same; neither at Scutari nor the Crimea, had the principal medical officer the power to secure from other quarters the co-operation and assistance indispensable, whilst the weight of responsibility was left entirely upon him. More power must be placed in the hands of the Medical Staff; the decision of Medical Boards held by experienced men in all matters relating to the



physical condition of the troops, must be vested with something like authority, and the medical officer should be amongst the very first, instead of amongst the very last, to be consulted in all the great operations of war. At present the English army medical officer has no power in matters where he should be all-powerful. Look at the consequences. Why was there a deficiency of field supplies at Alma? Because the transmission of those supplies was not permitted to that authority who alone could conduct it. Was there a deficiency of stores provided? No. The medical authorities did their part in selecting all that was required, it was in the stowing and transporting of these stores that the lamentable failure was, and in the stowage and transmission the medical department had neither hand, act, nor part.

I say, gentlemen, *that the Army Medical Department has not been fairly used.* The undue suffering of our gallant army through that long and dreary winter has been attempted to be attributed to the failure of the Medical Department. *I tell you that grosser injustice was never perpetrated.* I will do more, I will prove it to be fact.

The causes of the wretchedness and misery of our soldiers were beyond the medical officers' control; they had no power of regulating their own affairs; they could not increase the number of their staff; they could not order the conveyance of the ambulance from Varna to the Crimea; they could not provide carriage for the wounded from the field of Alma to the shore, nor yet transport them across the Black



Sea to the Bosphorus; but what human hands and hearts could effect, they did. I have the honour of knowing personally many of these maligned men, *and I tell you that they are inferior to none, either in professional acquirements, or in those qualities that characterize the British soldier and the gentleman.*

The position of the Medical Department in connexion with the present campaign cannot, I consider, ever be more legitimately discussed, or more publicly brought forward, than upon the present occasion. Will you, then, allow me for a brief period, to trespass on your time, and to state what were the real causes of the miseries of the Crimea.

The first and principal cause was neglecting to follow the suggestions of the Medical Department. This I will now prove. I will make no general statement; I will come to facts.

War with Russia was declared on the 8th of March, 1854, and on the 4th of April, the Director-General, Dr. Smith, wrote officially in these words:—

“If the means of averting disease be not rigorously observed, the British troops will suffer seriously from the moment they land upon the Turkish shores. The clothing which the soldier has at present is not suited to the climate in which he is to serve, nor the duty in which he is to be engaged; and if the necessary adaptation be not effected, sickness, and undue sickness, will be the result.

“The British forces will be exposed to great heat and an extreme of cold. I feel, therefore, constrained to recommend that an inquiry should be instituted, to ascertain if the dress of the soldier cannot be made to contribute to his comfort and efficiency more than it does now; for, as at present constituted, the shako is cumbersome and heavy, the leathern stock unfitted for the field, whilst the coatee,



tightly buttoned to the body, restrains the limbs, and oppresses the man with heat. He should have loose and easy-fitting garments for the hot weather, and be placed (at the expense of the nation) in possession of flannel shirts, woollen drawers, and worsted stockings, to enable him to stand the winter cold.

"There is reason, too, to fear, that from the absence of, or badness of, the roads, wheeled vehicles will not be able to convey the sick and wounded. More simple means of carriage must be adopted, and I propose, therefore, that a body of 800 able men, natives of the country, be raised at once, 'as a Hospital Conveyance Corps,' and if duly organized, and properly managed under military discipline, they will prove most effective for the purpose required, and greatly advance the cause of humanity.

"The welfare of the sufferers and of the army will require that those disabled by wounds or sickness should be removed from the vicinity of the conflicting forces. Ships, therefore, should be *liberally* provided, some for the purpose of carrying to England, or elsewhere, men not likely to be soon available for further service; others in use in harbour, as floating hospitals. The ships for the above-mentioned purposes should be commodious steamers, high between decks, thoroughly ventilated, and having fixed berths."

Gentlemen, I beg you to note that these letters were written and sent on the 4th of April, the 13th of April, and the 10th of May. The battle of the Alma was fought on the 20th of September, after five months had passed away. Where was the hospital corps to carry the wounded to the shore? Where were the fitted transports to convey them to Scutari or the Bosphorus? But to look further: our army took its stand before Sebastopol. Six weeks more passed over, and what was done to aid that army? A while longer, and the days declined. Autumn gave place to winter, aye, and such a



winter, and our gallant troops stood in the tattered remnants of their summer clothing to face the Crimean cold. The keen blast, cutting with its icy edge, thrilled through the soldier as he kept his watch on Balaklava's heights. The damp mist chilled him, and the cold rain drenched him, as he toiled amidst the darkness of night in the mud-soaked trench. Where were the warm flannels now?—the woollen drawers?—the worsted stockings? *Were they wanted? Aye, and wanting.* Sadly and silently the flower of England perished. The flower perished, but not the stem from whence the flower sprung; England herself remains, and soon will be a stronger rooted tree than ever. Decision has been called for by the nation; he has come and found the tree shaken. What has he done to prop the tree? Not placed around it one or two dry sticks, that howsoever goodly-looking in the sunshine, would snap and break away if borne on by a foreign blast. No; he has called upon society to join hands to hold it for awhile—to bear with any little temporary shaking till it recover from the last winter's shock. He knows the ground around it is the source of permanent support—the source from whence the tendrils are to find the sap to fill the head. He has broke up the ground, and opened new channels for intelligence to flow towards the roots; he has loosed the iron band of routine, which, propped on patronage, encircled the trunk, and gave it false support; he has loosed this band, and thus allowed intelligence and understanding to pass slowly up: Oh! that he would



burst that band, and let this sap run through the country's trunk to every spray.

This may be imagery, but this is truth. The picture I have painted, and yet will paint, is but the faithful portraiture of last year's scene. What were the causes that carried off our brave soldiers to inglorious graves? Hardship, drenching rain, and pinching cold, short rations, insufficient clothing, nightly labour. These were the seeds; and scurvy, dysentery, diarrhoea, cholera, and fever, its fruits. Wholly to prevent these ravages might be impossible; still, to mitigate them was within the range of human foresight, and had the right means suggested by the Medical Department, been used at the right time, last year's campaign would have been greatly shorn of its horrors. Neglecting these the British army suffered. Death held his reign. Brave soldiers perished in misery and filth, their decomposing bodies sending noisome vapours up into the nostrils of the rest, blighting and destroying all that breathed that tainted air.

At one period our army lost, from these causes, over one hundred men per day. Of our comparatively small force in the Crimea, 4,000 were ill in camp, and more than double that amount of men sick in hospital at Scutari and elsewhere. Some regiments were extinct, or nearly so. A fine regiment had at one time seven men only, and another corps but thirty soldiers fit for duty. Our picked and chosen Guards, who sailed from England nearly 2,000 strong, could muster little more than 200 on



parade. Of the fine army England sent away in all the pride and pageantry of war, how few remained to celebrate the anniversary of their landing on the Crimea!

And who was it that, through that dread time of pestilence and death, struggled by day and night to stay the plague? *The Medical Department*—the staff and regimental surgeons—these men, I do maintain, individually and collectively, so discharged their duty to the nation, as to call forth the nation's gratitude. I have inquired from numbers that have returned, sick and wounded, officers and men, what was the treatment they received from the surgeons under whose care they came? I have had but one reply—viz., that anxious care, unceasing kindness and attention, with the most skilful treatment, met them from the moment they fell wounded on the battle-field, or struck down by sickness, till they reached England's shore. This, it may be said, is private statement. If their conduct in camp and field be such as I here say it is, *why does not public record tell the same? Why are their names held back in each despatch if they are worthy of being placed upon the pages of the Nation's Register?* Why? *Because, routine has, as it were, fixed a scale of names that are to appear on each occasion, and of those that are not.* And yet, in spite of this injustice, (for it is no less,) the deeds of some have forced the unwilling pen to write their names. And thus I read of Wilson, Phelps, and Greer—of Brady, Taylor, Wrench, of Jeeves, O'Callaghan, and *noble*



Thompson—what shall be said of him? what of a man who, exhausted by fatigue in tending on his wounded foes, sunk a martyr to humanity? Why, that in chivalry there is not aught that can surpass his noble conduct towards the wounded Russians; and he, I say, is but a sample of his class.

Who, then, was the cause of all the misery our troops endured? Who to blame? The Medical Department? No! it was not; **IT WAS THE NATION**; it was you and I, and all who suffered miserable starveling creatures, trading hucksters, to awe and govern in the House of Commons, and to sacrifice to their own interests the country's character, the prestige of the British arms. What, but the pluck and courage of the officers and men of the Crimean army, has saved England? Had they succumbed—had they not, despite of cold and hunger, overwhelming numbers, and disease, held a bulldog gripe of Russia, *where would England now be in the scale of nations?* This is the point for deep consideration. Let us, then, ponder on it. Let us profit by the sad experience of the past. Let the words uttered by the Duke of Cambridge, in the Town-hall of Liverpool, be re-echoed by the country. His Royal Highness said—"The lesson learnt from these events, he trusted would not be forgotten; and that lesson was, not to starve our establishments in time of peace, or to maintain them in such a low state of efficiency as if we thought another war impossible. The defects from which we suffered were not so much the faults of individuals as of our system,



and still more, of the state to which our war establishments had been reduced by forty years of peace."

His Royal Highness here spoke from experience. In doing so he but confirmed what had been said by Mr. Herbert, who, speaking in the House of Commons in his place as Secretary-at-War, spoke the truth, and those who know the Honorable Sidney Herbert know he can speak no other. He said England commenced this war without an army. She had troops, and chosen troops; but what were their numbers? Why, commensurate with the magnitude of our possessions, scarcely to be considered more than military police. I will go further: I will say (for it is useless to conceal the fact) that England at the commencement of this war had a false notion of its own position. It looked upon itself with satisfaction as a power whose military system was perfection. Brief experience showed the fallacy of this opinion; it revealed our whole military system (beyond the regimental) as defective in the field; its arms had to be changed, the Minié rifle to be substituted for the musket, and our artillery made of double weight; our soldiers' clothing changed; the shako he discharged himself, the stock after a struggle was taken from his neck, and the tight coat changed for an easy frock. The Commissariat service was found totally unequal to all the arduous duties it was called on to perform, and a Land Transport Corps had to be embodied to carry the supplies. The Medical Department was defective in everything *but the character and talents of its officers*. It is needless, however,



to prolong this catalogue, or to particularize; for, in one word, our system throughout was bad. Shall it remain so? No; the nation has the wish to repair every defect, and Government the power, and not alone the power, but the will. From the War Minister's own lips have I received the assurance that it is his and the Government's intention, in relation to the Medical Department of the army, to make this service as perfect as means can make it, so that it shall be a credit to the country, and an object of desire for the whole medical profession.

Gentlemen, there are grievances under which its members labour; but this state of things soon will cease. Already has the sister service been relieved of one of its greatest drawbacks; I mean the denial to the assistant-surgeon of a cabin. This necessary accommodation has been granted without qualification or reserve. The withholding of this privilege was an unwise act; for, to my own knowledge, within the last few years, many men of prime ability, and most desirable for the public service, have refused to undergo the annoyances of the cockpit of a man-of-war, and have taken to the mercantile marine, talents which should have adorned the Medical Department of the navy. Grievances, gentlemen, I know are always a theme of popular discourse; but it is not of them that I have to deal to-day. The subject on which I feel impelled to speak is the position of our country in connexion with the present war, and the influence which our profession may exercise for good or evil. Directly or indirectly we have all had more



or less occasion to regret this war ; and yet, on principle, I do believe that we ought to regard its advent as a blessing. I believe that Russia at this moment acts the true friend of England ; and that we are deeply indebted to her for forcing on this war ; and, why ? Because, she has stripped the handkerchief off England's eyes, and shown her that she slept on sinking ground ; roused her to exertion before she had sunk too deep, and whilst she yet could save herself. The struggle to effect this has been intense ; but she has done it. It has taught us where we were deficient. It has led us to comprehend in what our weakness lay, and to correct it. We have admired the splendid camps and field arrangements of our brave ally, France, and have compared them with our own. We have seen the difference ; but have we reflected where the difference lay ? France began to form her army on the 19th of June, 1815 ; England hers not until the 9th of March, 1854. If England would be on the same footing, she must, like France, keep up her establishments in time of peace ; she will then be equally prepared for time of war.

Our own immediate province in connexion with this subject, is not, however, to go into military detail, but to inquire in what, pertaining to the hospital and field equipments, France has shown her superiority to England. It is not, I say, in the medical officers themselves, but in the system under which they serve. The French have had a staff of carefully-trained men, of every grade needed in an hospital ; the English have had nothing of the kind.



The French attendants have been made perfect in their duties before quitting home ; the English have been taught literally nothing ; fifers and flute-players to-day, they are turned into hospital orderlies to-morrow. The British Army Medical Department has had no position commensurate with its importance. The Director-General has well expressed its actual state, by saying that hitherto it has been a parasite department hanging on others for support. Gentlemen, this state of things must cease. The Army Medical Department is a department, believe me, of paramount importance to the State. It has been kept down ; but why has it been kept down ? Because of the want of independence upon the part of its members. Discipline is one thing, but abject subserviency is another. Do your duty honestly, honourably, and faithfully, but having done it, *maintain your own position*. If you do not so individually, you will collectively be in times future, as in times past, a parasite department. The British army surgeon hitherto has had in his own person to combine the functions of physician, surgeon, and apothecary, purveyor, clerk, nurse, and dresser. In the French army, on the contrary, there is a division of labour which exerts a beneficial influence over the whole hospital arrangements, and its effect is striking, by the good order consequently produced. And whence came this superiority of system ? From one master-mind, left to work unfettered by routine. It came from Baron Larrey, *not Baron when he formed this system, but made Baron for so doing*. His career



so well illustrates the influence the surgeon can exercise over the well-being of an army that I must adduce it here. When M. Larrey joined first, the French hospital arrangements were as defective as he left them perfect. There was no field hospital whatever. The wounded soldier's sufferings suggested to him the necessity for organizing such, in the immediate vicinity of the field of action—a present help in the very hour of battle. Restrained by no rules or regulations forbidding him from carrying out his ideas, he formed at once that ambulance volante, which we have seen so admirably worked in the present war. Previously to this, the victims of the conflict had to lie for hours and hours on the battlefield, after all was over, before receiving help, many meanwhile perishing for want of aid. Larrey soon showed the perfection of his system by going into action, and taking his wounded out ; and beautifully does he describe the feelings of internal pleasure he experienced when contemplating (as he bore the first sufferer to the rear) the benefits he had conferred upon his countrymen.

His ambulance corps he adapted to the country in which he served. He had two-wheeled carts and four-wheeled waggons for plains, and where the country afforded roads ; for mountainous districts, and places difficult of access, mules with chairs and litters (such as now in use) ; whilst over the soft sands of Egypt he bore his sick and wounded, slung in baskets upon camels' backs. Thus far for the field. Active service being suspended for a while, and the



French army in cantonments, sickness came, virulent disease and pestilence appeared. Larrey stood forth to meet it. At once he extended the cantonments, built huts, separated the sick and healthy, and relieved all over crowding. He scoured the country, brought in vegetables, vinegar, and beer, improved the soldiers' bread, and thus the plague was stayed. Larrey looked not to physic nor yet to France for aid. Peace followed. What did Larrey now? He formed at once a School of Military Surgery, lectured, experimented, and in every form studied disease; collected and tried all sorts of instruments, and invented others to supply the wants of war. Larrey's resources were interminable. He was also cook as well as surgeon. His potages, placed beside those of his good, kind-hearted countryman, Soyer, might not, perhaps, have pleased the palate equally, but they did more, for they saved life. Reverses had attended the French arms; there was a total absence of all commissariat supply; death from starvation seemed imminent. Larrey was summoned in extremity. *He* saw no difficulty in the case. He took the best horses from the troopers, killed them on the spot, cut up the flesh, and made soup for all, flavouring it with powder taken from the cartridge-boxes.

Gentlemen, I think I need say no more of Larrey's value to the army. I have told you what he did; I will tell you now how he did it. He effected it in the same way precisely that Todleben defended Sebastopol — by *absence of routine*. Confidence was placed in him by Napoleon. He had uncontrolled



power over his own department ; what he saw necessary to do he did, and did at once. *Buonaparte looked to him for suggestions, treated with respect each word he uttered, and listened attentively to all he said.* His presence and advice were so valued by that great chief that he made no move without him ; and on his return from Elba, his first care was to secure Larrey's services for the grand army he led to Waterloo.

This was no fanaticism. It was no superstitious prestige that induced Napoleon to seek to have Larrey near his person. It was the knowlege of his value to the troops, his worth in the hour of need. No ! Larrey's fame was universal ; for no sooner had peace been finally secured to France, than foreign powers sought his aid. Free America invited him to the United States ; autocrat Russia offered high emoluments and honours if he would join her ranks ; and Brazil petitioned him to guide her army ; but he declined them all, though suffering at the time almost penury from Bourbon spite. Larrey declined all offers. "I remain," said he, "for France. Her sovereign is changed, but not her soldiers ; they are the same, and my solicitude for them forbids my serving any else." What truly noble feeling is here expressed. Does it not rightly justify what Napoleon said of the great baron—"A brave and honourable man is Larrey. If France ever raise a monument to gratitude, that monument should be to him."

The proudest day, however, in Larrey's life, was that on which he visited the lines of Chatham. Here,



his old professional opponent, Sir James M'Grigor, the Governor, and all the Staff, met him in full uniform, and conducted him over the hospital and fortress, and as he passed the outer gate he was saluted with military honours. Such was the feeling England entertained for honesty and worth.

What was it, gentlemen, that gained for Larrey this proud position? Not destroying life, but saving it. The military officer reaps fame (and justly so) by dealing death amid his country's foes; the surgeon by extending aid to friend and foe. Both are honourable, manly, fine professions; but is there not, (if closely analyzed,) a finer, holier feeling, in saving than in destroying life? I well know that the wild excitement of the charge, and the clash of steel handled as a sword, is far, far different from what its employment is when set in ebony as the surgeon's knife. I know that, in war, the soldier's is more attractive than the surgeon's life; but is it better? Does it conduce to greater happiness in early years, or peace in old?

I am not used to moralise, and no words of mine can equally support this view as well as those which I shall now quote from a letter recently addressed by a staff-surgeon\* of the army to his son (a pupil of

\* The writer of this letter is Dr. William Charles Humfrey, Deputy Inspector-General of Hospitals, and I publish it without his knowledge or sanction. It may be said, then, that being a private communication, I am not authorised in doing so; but I hold that it is but right that Government should know the private worth of men who are its servants. The public journals have given rumours of the civil element being about to be infused into the reformed Military Medical Department. Such amalgamation cannot be but unnecessary and uncalled for, whilst such men as Dr. Humfrey exist already in the department. The organization of the Smyrna Hospital was the work of this officer. Public record has testified to the ability of his executive powers there.



my own), who wished to change the scalpel for the sword. He says,

"I shall not oppose you, if it is your wish to quit our profession for the army, for ours is a profession in which no man should be kept against his will. Take your choice. My every effort shall be to advance you in whichever you adopt (*so long as you advance yourself*), but, before leaving that in which you are engaged, let me contrast the two. Does the troop officer, whose profession obliges him to take life, when ordered, perform the duty of a Christian so well as the surgeon? The medical profession is, in the eye of God, (next to his own service,) the very noblest of all professions. The physician's life is spent in acts of love and charity—in relieving pain, in mitigating suffering and distress. It is a profession in which all the good and kindly feelings of our nature are called into existence, and when practised by a man of liberal and generous disposition, there is none that commands respect and esteem so much, or more frequently obtains for its members friendship, gratitude, and good-will."

That it does so let me, in conclusion, give a proof. Let me adduce one of recent date, humble in origin, it is true, but not on that account to be reckoned of less worth. It is not the record of a farewell piece of plate presented to a surgeon by his brother officers,—that cherished gift,—No, it is simply a notice from the columns of *The Times*, but a notice recording—what?—the spontaneous expression of the private soldiers' gratitude, and runs thus—

"We, the undersigned, one hundred and fifty-eight sick and wounded soldiers returning from the seat of war (on board the ship *Saldanha*), cannot separate without expressing publicly our heartfelt gratitude to Dr. Fyffe. During the long passage home, morning



and evening, noon and night, he was at the bedside of the suffering man; and when it pleased the Lord to call the soldier to himself, then, in that last dread hour, when earthly aid could do no more, was he still there, fervently imparting spiritual assistance to the dying man.

"The names of many officers of lesser worth, we do not hesitate to say, have been brought to public notice by high official friends; but we will introduce into our humble cottages, with grateful recollection, for many years to come, the name of Dr. Johnston Fyffe."\*

And who is Dr. Johnston Fyffe? He was a short time since a student of this college; a short time since he sat where you sit now. May I, a short time hence, from off the present benches, draw like examples for future illustration.

THE END.

\* Dr. Fyffe was at this time assistant-surgeon of the 30th Regiment.



Inspector General Tugmore  
with the Author's Compliments  
NOTES TOWARDS  
THE HISTORY TRACES

OF  
THE MEDICAL STAFF

OF THE  
ENGLISH ARMY

PRIOR TO THE ACCESSION OF THE TUDORS.

ENLARGED FROM A  
PAPER READ BEFORE THE PUBLIC MEDICINE SECTION AT THE ANNUAL  
MEETING OF THE BRITISH MEDICAL ASSOCIATION  
IN BIRMINGHAM, AUGUST 1872.

BY  
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THE HISTORY OF THE  
ENGLISH ARMY

# THE MEDICAL STAFF

BY  
THE MEDICAL STAFF

OF THE ENGLISH ARMY

IN THE  
PREFACE

THE MEDICAL STAFF

OF THE ENGLISH ARMY



## PREFACE.

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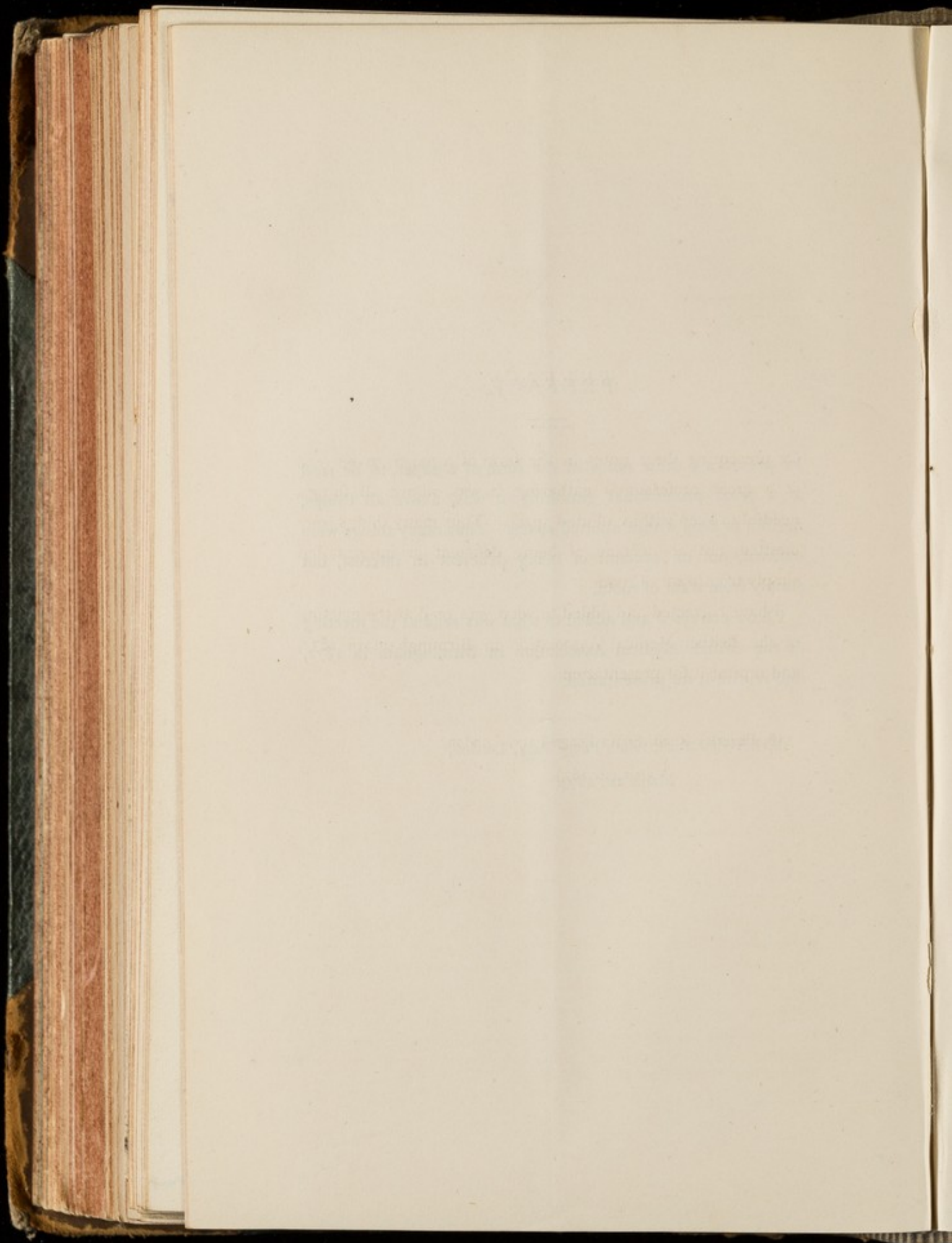
IN presenting these notes in the form of a paper, to be read at a great professional gathering, it was, above all things, needful to keep within allotted space. Thus many things were omitted, not on account of being deficient in interest, but simply from want of room.

I have corrected and added to what was read at the meeting of the British Medical Association in Birmingham in 1872, and reprint it for presentation.

18, Beverley Road, South Penge Park, London,

March 1st, 1873.







NOTES TOWARDS THE HISTORY OF THE MEDICAL  
STAFF OF THE ENGLISH ARMY PRIOR TO  
THE ACCESSION OF THE TUDORS.\*

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OUR military medical history commences with the third Roman invasion, when the Emperor Claudius, A.D. 43, landed in Kent, took command of the army of Aulus Plantius, crossed the Thames, and took Camalodunum (Colchester) by siege. In the following year the Senate decreed him a triumph, and conferred on him the title of Britannicus, to be inherited by his then infant son, and gave honours to his military followers. Amongst these was Scribonianus Largus, *medicus*, who, it may be presumed, shared in those honours and privileges, and who made for himself literary renown also. He wrote a treatise *On the Composition of Medicines*, containing about three hundred formulæ, among which it has been surmised there may have been some remedies of which he gained a knowledge in the campaign in Britain. His treatise was held in high repute, and a century later Galen introduced several of his formulæ in his writings.

A sadder reminiscence rests on the name of another Roman military *medicus* who served in Britain. In the ruins of Chester-in-the-Wall (anciently Borcovicus, a first-class station) there has been found a mortuary stone, six feet high, bearing this inscription: "Sacred to the infernal Gods. To Anicius Ingenuus, *medicus* in ordinary of the first cohort of the Tungrian Legion. He lived xxv years." This Tungrian (Tongres, *hodie*) legion was recruited on the banks of the Maese in Belgic Gaul, up to Spa, then as now famous for its mineral waters. Two of its cohorts marched north under the Emperor Severus A.D. 207, and the guardianship of Borcovicus was entrusted to its first cohort, which recorded, in a tablet that has been found, that it constructed a thousand paces of the wall.

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\* Read before the Public Medicine Section at the Annual Meeting of the British Medical Association in Birmingham, August 1872.



We know that whatever the nationality of a Roman legion, its officers were Romans of family rank ; and this *medicus* who died so young must have been, from his name—Anicius Ingenuus—a man of good descent. In early manhood he was *medicus* of the first cohort of a celebrated Roman legion, which, consisting of 1,100 men, was of double the strength of the other cohorts. They led the van in battle, and guarded the eagle—the standard of the legion — and of them it was said by Cicero, “His divina et presentia signa venerantur.” From this incident of the regard in which the young *medicus* was held by his cohort, may be inferred the carefulness of the Romans in appointing their military *medici*, who, like our own, stood in the double capacity of physician and surgeon to their corps.

Britain was to the Romans a far more difficult possession to conquer and to hold than India has proved itself to be to us modern Britons, for throughout an occupation of three hundred years its tenure was “by the sword”. Among the Roman emperors, Cæsar, Claudius, Vespasian, Adrian, Severus, Caracalla, Constantius, and Constantine the Great, owed much of their military reputation to their services in Britain, which shows the importance of that command ; and Great Britain is indebted to Indian warfare for the training of many of her most famous generals. The sculptured stones that tell of the Roman occupation are highly treasured by modern Britons. Whatever may be the duration of our hold on India, it is open to doubt that, after a lapse of fifteen hundred years, there will remain such a sculptured testimony erected by the officers and men of his regiment to tell of their regrets and of the worthiness of any of the hundreds of medical officers who have fallen at their posts in the acquisition or defence of the British Indian empire as that which still remains in memory of Anicius Ingenuus, the young Roman military *medicus*. Happily, time, the destroyer of all things, has not erased the monument to him erected by the first cohort of the Tungrian legion.

Our Saxon forefathers were a very martial race, every freeman being a “weaponed man”, born to bear arms, dishonoured in appearing without his sword, having the inherent right of private feud, and of maintenance in just quarrels by his kindred and neighbours ; and he was bound to serve the king in defence of his kingdom for any term the occasion might require. Of their military organisation and customs, very little further than this is known.

*Leechdom*, or the art of healing, from the Saxon word *læce*, meaning, according to Ernest Schulze, a *physician*, was much esteemed in



Saxon England, and it was always combined with the priestly office. *Domesday Book* does not give us the name of a single Saxon *medicus* possessing land under Edward the Confessor ; but, among the tenants *in capite* under the Conqueror, there is the name of one Aluric possessing an estate in Hampshire. The land in his possession was also before the Conquest in that of an Aluric, a common name among Saxon landowners, and we may infer that he inherited one of his numerous family estates, if he were not the individual who had been deprived of the greater part of them at the Conquest.

The respect in which the art of medicine was held is displayed in the ecclesiastical canons of the reign of Edgar (959-975 A.D.), wherein analogies are drawn between spiritual sins and bodily diseases. Penitence is likened to medical treatment under a skilful leech, and its results to the action of a "vomit" in expelling a deadly poison ; and it is decreed that confession should be made under this formula : "I confess to Almighty God, and to my confessor, the *spiritual leech*, that", etc. These are appeals to the mind of a rude race, made through the known to the unknown, such as our missionaries may employ now : they show how closely medicine was affiliated to theology. One of the primitive duties of Christianity was the care of the sick, maimed, halt, and blind ; and up to the twelfth century the art of curing lay in the province of the church. Its *materia medica* consisted of simples ; and more cures were effected by altered regimen, by visits to holy wells, and by faith, than by medicaments, some of which were of disgusting or of revolting nature, strangely mixed up with pagan charms, magical arts, superstitious prayers, and offerings to shrines.

Our knowledge of medical affairs among our Saxon forefathers has been elucidated of late through the liberality of the government in providing editions of the literature of that age. Thus we are in possession of an interesting work on *Leechdoms, Wortcunning, and Starcraft of Early England*, collected and edited by the Rev. Oswald Cockayne, M.A. Cantab., which reflects a strong light on the personal habits, social and domestic customs and practices, and on the state of morality, prevailing among the Anglo-Saxons. We find that even in that age of darkness those who were the *literati* were also the *healers*, and that they pretended to an acquaintance with the writings of the Greek physicians. In their history of medicine they assigned to Apollo the art of surgery ; to Æsculapius the art of curing internal disease ; to Asclepias the clinical observation of maladies, and the logic or art of reasoning thereon ; to Hippocrates the teaching diagnosis of diseases ; after



whom Plato and Aristotle rendered all consistent by the theory of four temperaments, corresponding to the four natural elements.

Of their practice, we may best judge by some of their prescriptions ; thus for fever, it is recommended "to take a snail and purify him, and take the clean foam, mingle it with woman's milk, give it the man to eat, it will be well with him." No diet can excel this in its primitive simplicity. For "nyctalopia" (that is cataract) : "The men who are unable to see nothing after sunrise till he again go to his setting ; take a knee-cap of a buck, and roast it, and when the roast sweats, then take the sweat and smear the eyes therewith, and after let the blind eat the same roast ; and then take a new asses tord, and squeeze it, then let them take the ooze and smear the eyes therewith, and it will soon be better with them." These are fair examples of the Saxon *materia medica* used by the clerical leeches, which probably embodies the foulest charlatanry that has ever defaced the practice of medicine. We would expect to find a rational empiricism or practice based on rational experience, that leads to a reliance on specifics ; but of these there is only to be discovered an acquaintance with one—that of sulphur and tar for the itch : "Against *handworms*—ship tar, brimstone, pepper, white salt ; or wax, brimstone, and salt ; mix and smear." They knew the *acarus*.

In primitive society throughout all ages, barrenness in women and the want of virile power have been regarded as among the greatest afflictions of humanity ; and the Saxon priestly leech did not deem these matters unworthy of his study, nor indeed others which are more fitly consigned to the arcana of the mere voluptuary, the whole of which were dealt with in the plainest Saxon terms, without the decent intervention of a dead language.

Where medicine was in this condition, it is certain that surgery would also be debased and in darkness. Of operative surgery beyond phlebotomy there is no trace ; but of the mode of dealing with a fracture there is an instructive description in these words : "If shanks be broken, take bone-wort, pound it, pour the white of an egg out, mingle these for the shank-broken man. For a broken limb, lay this salve on the broken limb, and overlay it with elm-rind ; apply a splint again ; always renew these till the limb be healed. Clean some rind and take linseed, grind it for a brewit or paste with the elms drink ; that shall be a good salve for a broken limb."

This portrays the employment of demulcent cataplasms, of albumen (for collodion) to close a wound of the integuments, fortified with a



backing of the soft inner bark of the elm (for lint), the use of splints ; and it counsels the assiduous use of the means until the fracture has united. This assures us that the art of "bone-setter" was advanced in the Saxon age ; but the treatment of wounds was not equally regulated by common sense, judging by that recommended for man and his domestic animals, who were much cared for in this ancient leechcraft. Thus, "for wounds that swell", or become inflamed, "take furze and pound it, and lay it upon the swollen part, and it shall soon subside." Again : "If a horse or other beast be shot" (that is with an arrow), "take a seed of dock and scotch wax, let a mass-priest sing twelve masses over them, and add holy water, and put that on the horse or on what cattle soever it may be. Have the worts always with thee." This at least is certain, that the resinous covering would benefit the wounded animal, and the reading or singing the masses would bring his "honoraria" to the ecclesiastic leech.

We may infer from these receipts what means were employed in the treatment of arrow-wounds and of contusions received in battle. The alienation of the art of curing from the priestly office began in our Saxon era, when the fourth Lateran Council (993 A.D.) prohibited the regular clergy from doing any operations of surgery "involving the shedding of blood", and assigned manual operations to seculars and clerks.

Surgery, then, underwent some social degradation, which laid, however, the foundations of its freedom from priestly interference, and tended eventually to its becoming a science. Medicine was not disassociated from theology before 1131 A.D., when the sixth Lateran Council forbade monks and regular canons the study of civil law and medicine. This was in the reign of our Henry I ; and it was about that time, according to Colliette, that in France practitioners were called "myres", by which appellation they were popularly known through several centuries ; and the title appears in England in the reign of our glorious monarch, Edward III. Two derivations of the title myre have been advocated : Latin, *mirus*, admirable, extraordinary ; and Greek, *myron*, unguentum ; hence *myropæus*, an anointer ; and *myropolos* an apothecary. It is possible that this new title originated with the institution of lay practitioners, after the decree of the sixth Lateran Council ; and I am inclined to an opinion that they were a class that combined again the practice of medicine with that of surgery, as among the Romans.

About this epoch the revival of learning produced Latin editions of Hippocrates and Galen, whose works becoming familiarly known



in the west of Europe, a demand arose for the drugs of the Levant. The student of those authors obtained the reputation of knowing the laws of Nature (*φυσικῶς*), and of being able to assist her operations, from which they assumed the new designation, "physicians"; while the change in practice from the use of indigenous simples, which every rustic could distinguish, to that of the Eastern drugs, called for a new order in the profession, to import, store, and dispense these costly and potent agents: thus arose the apothecary, whose office was previously unknown in Western Europe, and not in England before 1300 A.D.

The technical titles employed at this dawn of the modern medical profession were those of physician, *mire* or *myre*, and apothecary—the antecedents of academical titles and distinctions of the baccalaureate and doctorate, which were first conferred in France in 1140 (Louis VII), and in England in 1207, in the reign of John. The title of "Surgeon" first appeared in English history when Edward I invaded Scotland in 1299.

In addition to these subdivisions of the medical profession, there arose another in the Middle Ages out of the numerous body of the tonsorial craft, whose vocation, being centred among the communities of the shaven priesthood, obtained from it the reversion of surgery at the end of the tenth century. The barber, being dexterous in the use of cutting instruments, naturally enough assumed the position which the priest was called on by canon law to surrender; and so long as the art of surgery was comprised in bone-setting, tooth-drawing, cupping and blood-letting, and anatomy was untaught as the basis of surgical science, his facility of manipulation and habits of rendering personal services gave the special training by which the ambitious barber might hope to obtain repute as a *chirurgien*. The "*myre*", as the representative of a higher class surgeon-apothecary, did not flourish in England as he did in France, and the doctor of medicine, who had taken the place of the ancient priest-doctor, regarded the manipulations of surgery as undignified; thus the barber-surgeon rose into repute in the city of London, and municipal privileges being secured to his craft A.D. 1376, the corporate body gained importance, attracting to itself those who purposed to practise surgery alone.

Surgery formed its alliance with barberdom on account of manual accomplishments and civic wealth. The union was not a happy one, as surgery was impatient of the yoke, which, while conferring municipal substantial benefits, disparaged purely surgical acquirements. Yet a separation was not effected until the middle of the eighteenth



century, after union in some form or other since the fourth Lateran Council, A.D. 993. So slowly do corporate rights give way.

This cursory recapitulation of the status of the medical profession will throw light on my subject—the history of military surgery.

Nothing whatever is known of those who, in the capacity of healers, attended on our warlike kings, or followed their armies in the field, prior to the Conquest.

From *Domesday Book*, which dates from twenty years after the battle of Hastings, it is learned that there were in the train of the Conqueror two medical attendants—Gilbert Maminot, presbyter and *medicus*, and Nigellus, *medicus*—both of whom stood among those possessing estates by gift of the Conqueror.

The first of these was a cleric of noble family, whose chief—another Gilbert—was enfeoffed in the barony of Maminot of twenty-four knights' fees, and was one of the eight trusty barons charged with the maintenance and defence of Dover Castle, the most important fortress in the land. Gilbert Maminot was the king's chaplain also, and, as an ecclesiastic, he was deterred from surgery by the fourth Lateran Council edict, and therefore it may be inferred that he did not follow his military movements in the field. It is even probable that he was more in attendance on the Conqueror's queen than on himself, for we find that Gilbert the "presbyter" was tenant *in capite ex dono reginæ* of an estate in Hidincforth Hundred in Essex, and that he does not appear to have held any lands *ex dono regis* prior to his installation as Bishop of Lisieux in Normandy, which see was conferred on him by William in 1077 A.D. In *Domesday Book* he appears tenant *in capite* as "Gislebertus, episcopus Lisiacensis", for an estate in Gloucester, with which, we may infer, he was invested subsequently to his installation, while the gift of the queen was made to him previously to that, unless there were two priests, "Gislebertus" by Christian name, among the royal followers, one of whom held only clerical, and the other both clerical and medical, position in the retinue.

Nigellus\* was a layman, I believe, and his name I now propose as that of the first surgeon in English military history. He stands as the

\* The Rev. R. W. Eyton, in his *Antiquities of Shropshire* (the model of county history and topography), states, vol. x, p. 1, that Nigellus was a clerk and physician. He does not state that he was a priest in orders, and he appears to base his opinion of his being "a clerk" solely on the fact that the estates conferred on him in Shropshire had been previously in possession of Spirtes, an eminent Anglo-Saxon ecclesiastic, who was exiled by Edward the Confessor. He asserts that Nigellus was physician to Count Roger de Montgomery in 1086 A.D.



Baron Larrey of his day, following the fortunes of the Conqueror of England. He appears in *Domesday Book* as tenant *in capite* of estates in Hants, Wiltshire, Hereford, and Shropshire, with which he must have been invested in reward of his services in the capacity of *medicus*, and, it may be inferred, in the special branch surgery, which it was not lawful for ecclesiastics to practise. His first two possessions in Hants and Wilts may have been given immediately after the Conquest in the first distribution of lands ; but the last two must have been of later acquisition, as the subjugation of that part of England was effected at a later date, and the Conqueror could not have conveyed to his followers any lands of which he was not the actual lord by conquest, and by dispossession of their Saxon owners.

It may be assumed that, as soon as William had completed the successive subjugation of the provinces, the lands were distributed among those who were present, according to the estimate of services rendered, and that these estates in Hereford and Shropshire were the reward of Nigellus on the conquest of the Welsh Marches, and that possession was given by "seizin", or on the spot. Nigellus was possessor of other estates, which, not being of regal gift, must have been by feof of the great barons, who subdivided their large grants from the king among vassals on military tenure. These estates must have been the reward of professional services to the donors ; and Nigellus, not unmindful of the church, although himself a layman, endowed the church of Monteburgh, in Normandy, with an estate of this kind, situated in Somersetshire.

From these unquestionable data, it may be inferred that the profession was well represented and well rewarded at the conquest of England ; and in them we possess the historical proof of the value placed on military services by one of the greatest generals and sovereigns in universal history, whose descendants still possess, after the lapse of eight centuries, the throne he acquired, now giving laws to the widest empire the world has known.

After the completion of the great event on which all the subsequent history of England turns, "we know", as Hallam tells us in his *History of Europe during the Middle Ages*, "that the Conqueror distributed this kingdom into about sixty thousand parcels of nearly equal value, from each of which the services of a soldier were due. He may possibly have been the inventor of this politic arrangement". The service due to the king was limited to forty days in the year, after which it was continued at the expense of the crown. As military service was thus rendered feudal and but of short duration, medical services, it may be in-



ferred, were of the same nature, and if any were required they were provided by the great barons for their feudal contingents. Doubtless the Norman kings were attended by their selected professors of the art; but as the privy expenses of the courts of these kings have not come down to us, nothing whatever is known of them. As, however, in their next appearance in our history they continued to be of continental extraction, so it may be inferred they were so in the blank interval.

The next page of military medical history opens in the reign of Edward I, at the commencement of the fourteenth century. The Crusades had taken up the interval since the Conquest, beginning in 1096 and ending in 1291 A.D.; and it would appear that so late as the third crusade (Richard and Philip) these fanatical expeditions were unattended by any professors of medical and surgical knowledge. This can scarcely be wondered at when we reflect that, as concerns their spiritual wants, they were without special advisers, each crusader being provided before setting out with the consecrated elements; and as the functions of the priestly office were thus superseded, so were those of the leech by relics and amulets. Probably direct intercourse with the Saracens may have caused respect for their superior medical attainments and practice, as the celebrated Arabian school was then at its climax and the works of Rhazes and Avicenna were in high repute. It may indeed be credible that in a warfare where courtesies were not unknown, the surgeons in the suite of Saladin, and his humane brother Saphadin, may have afforded their aid to the wounded in the camp of Cœur de Lion. Although the crowned heads of England were not represented in the Crusades like those of France, yet their scions and their great nobles brought together large contingents, conducting them on French principles rather than by any independent nationality. Among the traditions of the Crusaders, we find that Robert, eldest son of the Conqueror, was distinguished by his many acts of bravery and chivalry in the Holy Land, which he left in consequence of a severe wound. On his return he landed at Brindisi, and tarried in South Italy to have his wound cured by the famous professors of Salerno. While under treatment, he received a wound of the heart from a fair Norman, Princess Sibylla of Apulia, who may have done the nursing, which was common in those days, as it has again become in our own, and he made her his wife. He must likewise have gained the high opinion of those who treated his wound, as the professors of Salerno passed over the Norman dukes who had acquired Southern Italy, to render to him



the honour of the dedication of their famous "Regimen Sanitatis Scholæ Salernitanæ."

Richard I was the only English king who undertook a crusade. He did this with a large army and fleet, but the chroniclers say nought of medical attendants either in this or in the fleet of Philip of France; and Ducange, in his notations on Vinesauf, who was with Philip, makes this the ground for doubting that there were any. Our own Roger of Hoveden tells us that the English expedition was detained at Rhodes owing to the sickness of the king. Soon after landing at Acre, both Richard and Philip were seized with a disease, "*quam Arnaldiam vocant*, of which they lay near to death, and they became bald; but by the mercy of God they recovered from their weakness, and became stronger and more resolute in God's service". This happened in June 1191. About a year later, after his miraculous exploits in the recapture of Jaffa, Richard fell ill again; and, in broken health, he left Palestine in October 1192 A.D.

There can be no question of the mutual respect that existed between Cœur de Lion and Saladin; and it is well recorded, that on the plain of Jaffa Saladin sent presents of fruit and of cooling snow to ameliorate the sufferings of his adversary; and with that fact in view it is credible that skilful Arabian physicians may have been sent to advise on his treatment. It is certain that if Richard were without a military physician in his train, he must frequently have felt the want of such a follower. This was the darkest age of surgery when, after being cast off by the church, which then alone cherished the lights of science and learning, it had not yet taken the first step in advance of the capabilities of those who deemed it their most elevated duty to shave the crowns of the priesthood.

It has been believed that the mighty Cœur de Lion perished from mal-treatment of the revengeful arrow-wound he received at Chaluz; and, as our accurate historian, Strutt, gives it, "If that ancient rhymer, Robert of Gloucester, is to be believed, the Duke of Austria, who imprisoned our King, having fallen from his horse and bruised his foot, his physicians declared that if it was not immediately smitten off he would die; but none would undertake the operation till the duke took a sharp axe and bid the chamberlain strike it off, and he smote thrice ere he could do it, putting the duke to most horrid torture."

When Edward I was proclaimed King of England in November 1272, he was absent in the Holy Land on the eighth and last Cru-



sade, in which he was to have co-operated with St. Louis of France, who unhappily met his death by dysentery before Tunis in 1270, on the outward voyage ; and, from the silence of the Sire de Joinville on the point, there is ground to doubt his having had a medical attendant near him. Prince Edward of England would appear to have been situated better, as there was at hand an English surgeon to treat the murderous wound dealt him by an assassin at Jaffa in June 1272. Our contemporary chroniclers are silent on the romantic story of Eleanor sucking the poisoned wound inflicted on her husband. Carte, who is a very national English historian, giving his authorities, states : " The assassin, drawing a poisoned dagger, attempted to stab the prince in the belly, but the prince, endeavouring to parry it with his arm, received there a deep wound, and, striking at the villain's heels with his foot, seized the dagger and plunged it in his heart, though in wresting it violently from him he gave himself a wound in the forehead. The wound in his arm appearing very dangerous and likely to gangrene, the prince thought fit the next day to make a will ; *but the black flesh being cut away by an English surgeon*, it was healed in a little more than a fortnight, though not so thoroughly but he felt from time to time exquisite pain, and the scar which was left dropped some moisture continually for several years, till it was again laid open and then entirely cured." From this evidence, we may judge it to have been a punctured wound involving the bone, and the primary operation a deep incision or two for the relief of inflammatory tension. That a sinus remained, leading to an exfoliation that required a second incision for its removal, is the easiest way to account for the remoter consequences. The romantic stories of poison and suction may be altogether dispensed with, as they are unnoticed by the contemporary historians, Thomas Wikes and Walter Hemingford, who make no allusion to any influence resulting from her presence, unless prejudicial to the sufferer and compromising his recovery ( *V.* Appendix B ).

This incident affords proof that Prince Edward had with or near him in Palestine, in the year 1274 A.D., a skilful English surgeon, whose name, unhappily, is lost to fame, but his art must tend to exalt our traditional ideas of the condition of practical surgery in that age. I think that this unknown individual has a fixed claim as an English army surgeon worthy to be remembered for having been instrumental in saving the life of the grandest of our Plantagenet kings.

King Edward the 1st having experienced personally the value of surgeons in the field and in the camp, it is not likely that he ever forgot



the lesson. There are no records of the military economy of his expeditions into Wales, nor of his first expedition into Scotland in 1298, when Falkirk was the great field of slaughter; but his second invasion affords to the inquirer its invaluable record of costs in the wardrobe accounts of royal expenditure A.D. 1299-1300, that form the starting-point of our economical history. It may be apprehended that it is only from the absence of similar accounts of older date that we remain ignorant of an earlier like organisation. Where money is recorded to have been paid for services rendered, we have landmarks of history at least as certain as the face of a medal or coin, the presentation of which has sufficed to set at rest many a disputed point. With this wardrobe account before us, we cannot hesitate to fix the year 1300 A.D. as a date when an army medical service had actual existence among us. There are charges in the marshal's (war-office) expenditure for a physician and his two juniors (*valetti sui*), and for two surgeons, with one of whom there were two assistants (*socii*). Some of these, as well as an apothecary, are introduced in the household accounts on some heads of expenditure, in a manner showing the distinctions then matured between military and household medical services, or camp and court. The names and qualifications and ranks of the individuals are as follows.

|                        |                        |                   |
|------------------------|------------------------|-------------------|
| John de Kenle.....     | Phisicus regis .....   | Miles simplex.    |
| John de Shireburn....  | Valettus suus .....    | Scutifer.         |
| William de Rigethorn.  | Do. ....               | Do.               |
| Philip de Belvaco ...  | Cirurgicus regis ..... | Miles simplex.    |
| Edmund de Baunton.     | Socius suus .....      | Scutifer.         |
| One, name unknown..    | Do. ....               | Do.               |
| Master Peter.....      | Cirurgicus .....       | Scutifer simplex. |
| Peter or Perroto ..... | Apotecarius reginæ.    |                   |

Thus, we learn that in A.D. 1300, the professional distinctions of physicians, surgeons, and apothecaries, were recognised at our court, and it seems to me doubtful whether the last two names on this list were or were not of the same person. *Valettus* is an abbreviation of *vassalettus*, a diminutive of *vassallus* holding lands by military tenure under a feudal baron as tenant *in capite* from the king. The designation was applied to youthful aspirants of rank, even to those of noble families, who served in the retinues of the kings, princes, or great feudatories, before obtaining knighthood.

With regard to emoluments: The physician De Kenle, and the surgeon De Belvaco, appear to have received the pay of simple knights, two shillings a day, when knights bannerets were paid three shillings.



The assistant-physicians, de Shireburn and de Rigethorn, and the assistant-surgeons, de Baunton and his nameless associate, had one shilling a day, like mounted lancers, and vinteners, or sergeants of twenty footmen. In addition, the surgeon was repaid for expenditure on medicine and appliances in the field or at the court, and the physician was allowed one shilling a day subsistence-money when absent from the courtier's table on the king's service.

Physicians, surgeons and their assistants, were allowed the keep of horses for their conveyance, but pack-horses seem not to have been allowed to the assistants. The army practice was to begin daily pay on the date of presenting the charger for valuation, after which its loss or injury was compensated if it happened "*servicio regis*"; and, in other cases, when that could not be strictly proved, compensation was made "*ad elemosynam*". These rules applied to all alike on the marshal's roll. Thus, the king's physician was paid "*ad elemosynam*" for a horse dead at Greenwich, and the king's surgeon was paid for three horses dead in Scotland, "*servicio regis*", and for one, "*ad elemosynam*", which he seems to have lent his assistant, Baunton, to carry his baggage on the march.

Another head of expenditure elucidates the status of these medical officers. The "*Roba*" list presents to us the clothing or uniform allowances paid to those on the marshal's roll and royal household. The first scale was an annual allowance of sixteen marks, or £10:13:4 paid to bannerets; and the second scale, eight marks, to simple knights. The king's physician, De Kenle, and his surgeon, De Belvaco, receiving the second scale, indicates their social position at court and in the army to have been with rank of knighthood.

The "*valetti*" of the physician and the "*socii*" of the surgeon are not named on the "*roba*" list; but they appear on the pay list as "*scutiferi*," or esquires.

Pietro, "*cirurgus*," was of inferior rank to De Belvaco, "*cirurgus regis*," and his name appears among those of the courtiers, "*scutiferi simplices*," receiving only £2 a-year for uniform. As this "*cirurgus*" does not appear as such until A.D. 1302, and as Pietro, or Pierrot, "*apotecarius reginæ*," is named in 1300 and 1301, and not in 1302, I am of opinion that they were the same person. Having come from France with the young Queen Margaret, he was probably the first apothecary introduced into England, where he may have found his to be an inconvenient title,\* and have changed it for the better known one

\* Previous to this, the title "*Apotecarius*" was not unused in England, but it had



of surgeon. There is evidence of his having been at York, in waiting on the Queen, in the summer of 1300, but no evidence of his being in Scotland.

To comprehend fully the relations of these men with the army invading Scotland, it is needful to be acquainted with the king's movements. The feudal system was in full operation, and he had ordered his barons to assemble with their vassals at Berwick in the autumn of 1299 A.D., he being at the same time under contract to marry Margaret, the sister of Philip, King of France. The marriage was celebrated in Canterbury Cathedral on the 8th of September, and the queen was left at St. Alban's on the 2nd of November. Edward joined his army at Berwick on the 20th December, when his barons protested against any warlike operations at a season when the roads were quagmires. The castle of Stirling was abandoned to its fate, and the army dispersed until the summer of 1300 A.D., when it reassembled at Berwick, and, under the king's command, made some ineffectual incursions of Galloway.

The "wardrobe accounts" show that De Belvaco, "cirurgus regis," with his "socii," was present with the army in the fall of 1299, and that De Kenle, "physicus regis," was then at Caversham, by the king's command, in attendance on his daughter, the Countess of Gloucester, in childbed. In September and October, 1301 A.D., the "valletti" of De Kenle were with the army in Scotland, and thus we know that the medical staff of the army in 1200-1300 A.D., comprised both physicians and surgeons.

This is an outline of the *personnel* of the earliest recorded medical staff of the English army with its rank and emoluments. It was established by Edward I, worthily styled the greatest and most glorious of the Plantagenets, who may have been conscious of having owed his life to the skill of an English surgeon when in the Holy Land. In comparing the estimate set on medical services at various periods of history, it is of interest to note that the physician and surgeon of the army then received the same daily pay as the Admiral of the fleet—the first of that rank in English history—and their subordinates the same as the captains of the ships composing the fleet.

F. Grose tells us in his *History of the English Army*, vol. i, p. 238,

a much more lofty signification, being applied to the king's treasurer or keeper of the chest or depository. Madox, *Hist. of Exchequer*, vol. i, p. 79, states that Bishop Nigellus of London paid King Henry II the sum of £400 for the patent of Apotecarius, king's treasurer granted to his son Richard Nigellus.



that "In the Wardrobe Account of the pay of the army raised against the Scots by Edward II, A.D. 1322, many of the Welsh corps have an officer styled *medicus*, but whether by that term a physician or a surgeon is meant seems doubtful, as the word *medicus* is sometimes used for both a surgeon and an apothecary. None of these physicians or surgeons is charged to the English levies. And to the Welsh they seem to have no regular proportion to the number of private men—a corps of 1,907 men having only one, and another of 968 having two; the wages of all, except the two last named, was sixpence per diem each, those which were raised in the king's land in Cardiganshire had only fourpence each per diem."

It is easily understood that the Welsh levies, being of the unmixed old English stock, would be attended by *medici* of their own race knowing their language, and as they were all in receipt of pay direct from the king's treasury, so their *medici* would be specially named in the Wardrobe Account. With regard to the English levies, they were at that time entirely feudal, serving forty days in the field in England at the cost of their feudal lords, who were distributors to them of the king's pay after those forty days had expired or on embarkation for foreign service, and there are no baronial muster-rolls extant to show the ranks and offices of their retinue and followers, amongst whom there must have been surgeons. That their absence from the royal muster-rolls may be accounted for in this manner is evident from a document of later date, supposed to have been written *temp.* Richard III or Henry VII, which Grose adduces from the collection in the College of Arms, MS. i, 8, fol. 85, in which, after a list of the "Apparell for the field of a baron in his Souvereyn" (the King's) "Compeny, or for a baneret, or a ryche bachelor," is given that of the "officers necessary" to his retinue, "a chappellyn that to the mass belongeth, harberours" (quartermasters), "purveyours for your stable and for your vitayles, a barber, surgeon, etc.;" and in the retinue "of a knight or esquire of fair lande—a barber with his basin, with a store of towells," no allusion being therein made to a surgeon.

As the muster-roll of a baron, *temp.* Richard III, contained "a surgeon" as well as "a barber," who possibly were represented by one individual, we may conclude that the same provision existed in the great wars of the Plantagenets, when the dignity of the great barons in the field was at its acme.

The list already given of the medical attendants on Edward I, A.D. 1300, was that of the king's own medical and surgical staff, and



doubtless the great barons had each his own staff with his contingent of fighting men, otherwise there would have been a very inadequate provision of surgical aid for those great armies. At the best it must have been very inadequate to meet the wants of the wounded, but its insufficiency would be less felt when serving within the four seas, where friendly monasteries were always at hand with their barbers and other lay-brethren to afford aid, than in foreign service.

The next page of the history of the English army lies in the reign of Edward III, the glorious grandson of Edward I. It embraces the wars of that monarch for the crown of France, by claim through his mother as daughter of Philip IV, and is filled with the records of Crecy, Calais, and Poitiers, and of the great naval victories of Sluys and Winchelsea, but it closes with the surrender of all the hereditary possessions of the Plantagenets in France. In these wars the very principle of feudal service was undermined, and the army and navy of England first became "royal services" in the pay of the king, as it was not possible to carry on such wars on the feudal principle of forty days' service in the field.

The muster-roll of the great army with which King Edward invaded France in 1346 is extant; but with regard to its medical staff it is silent, except that the "Welsh," or British, who appear therein for the first time as a distinct body of troops in the continental wars, under the banner of the Black Prince, had an attendant physician of their own race.

Froissart makes no mention of any distinguished surgeons, nor does he allude to any services of members of the medical profession. It is inconceivable, however, that so large an army, whose stay in France was protracted, and which was greatly harassed by sickness, could have been less considered and provided for in this particular than was the army of the king's grandfather in the invasion of Scotland, A.D. 1300. It is more probable that the great barons who brought their contingents for the king's service, receiving the pay for their followers, had the engagement of surgeons, among others, in their own hands; and thus, as we know nothing of the economy of those separate contingents, we must ever remain in the dark concerning the medical affairs of the great army that won Crecy. Although physicians and surgeons of the English army do not appear in the muster-roll of Crecy, A.D. 1346, yet it is incredible that there was no medical or surgical staff present, as we learn from a wardrobe account of the eighteenth year of Edward III, A.D. 1345, by Walter Wentwayt treasurer of the household,



MSS. in possession of F. Grose, that in that year wages were accounted for to "one surgeon of the household troops, four doctors and one surgeon for the army in North Wales, and two doctors and one surgeon for the army of South Wales."

Such being the case in A.D. 1345 for an army of occupation within the four seas, it is inconceivable that an army on foreign war service could have been left unprovided with physicians and surgeons.

This omission of details may probably be accounted for in one of the great features of the revolution in military affairs brought about by the invasion of France by Edward III, which, in calling for the prolonged service of troops, rendered the barons contractors to the crown for the services of their followers, and the receivers and distributors of their wages from the date of embarkation.

The king's pay delivered to them seems to have been for fighting men only; but in addition to wages there was a royal allowance, or gratuity, termed "*a reward*," of 100 marks, or £66 : 13 : 4 per quarter for every thirty men-at-arms, and under special circumstances this was augmented to "one and a half," or £100 per quarter, and to "double reward," or £133 : 6 : 8 per quarter for every thirty fighting men. It is remarkable that these "rewards" were given at the expiration of a quarter for services rendered, while the wages were due at the commencement of the quarter for ordinary service to be performed.

I think there is evidence that this payment was made from the date of the invasion of France by Edward III, and I conceive it possible that the pay of the baronial surgeons may have been derived from it (*V. Appendix D*).

The age was one of general progress and of consolidation of Normans and British into the English nation, and yet there are no tangible proofs of progress in the manner in which the fighting men were cared for when wounded or sick. Our national records prove that the king esteemed very highly the medical services rendered to himself in England, and was bountiful in rewarding those who performed them, and this makes the silence of chroniclers on this point the more unaccountable. It is observable that in the wars of Edward I for the subjugation of Scotland, both medicine and surgery were well represented in the field, and its professors had a very respectable status assigned them; but subsequently to that there would appear to have been a falling off from that high estate. It is noteworthy of that era that it corresponds with the transition that surgery everywhere underwent in



passing into the hands of the barbers, whose social standing laid them and their mixed calling open to depreciation or even to contempt.

It happened, however, after the lapse of a century, when the barber-surgeons had by experience and education laid a broad line of distinction between their two vocations, that the superior division of them, by proving their utility on the field of battle, had the honour, as military surgeons, to bring about the *renaissance* of the profession of surgery, and to lay the foundation of its present honourable position: so much at least is due to those of them who served in the wars with France.

The first half of the fourteenth century was the era of the moulding of our profession into its present form. Our universities were established and granting degrees in medicine. Physicians were men of such education as to make them masters of colleges and teachers of the natural sciences, and to lead to their employment on diplomatic missions which had been mainly the province of churchmen.

Gilbertus Anglicus had written his work on medicine, that proves him acquainted with the writings of the Greek and Arabian physicians, which he condensed before A.D. 1220.

John Arderne, the first English writer on surgery, lived at Newark 1349 to 1370, when he settled in London, obtaining celebrity in both places by his treatment of fistulous tracks. His work is entitled "A Treatise on Fistula in the Fundament and other places, and Impostumes causing Fistulæ." He was a self-taught man, like Frère Jacques.

Anatomy was taught at Bologna, 1315 (under prohibition from Rome), and soon afterwards at Montpellier and Paris. The father of modern surgery, Guy de Chauliac, laid its foundations in France, and a college of barber-surgeons was instituted, 1371. In England the barbers were obtaining corporate strength in the city of London, where supervision by one of their order was instituted in 1308 A.D. Another step in advance was recorded in 1354, when, by order of the municipal council, a prior and three surgeons of the city were directed to make inquest of the results of treatment, by John le Spicer of Cornhill, of a severe wound of the jaw, and they reported that it had become "apparently incurable through want of skill" on the part of that practitioner, whose name is suggestive of his being an apothecary and not a surgeon.

In A.D. 1369 three master surgeons of the city were sworn at Guildhall to inspect and superintend the practice of barbers; and in consequence of surgery (minor) being pursued as a calling by unknown



barbers from the country, and by women, an order was given, A.D. 1376, that two master barbers of the city should examine barbers, and that none not possessing their licence should be admitted to the freedom of the city. Thus we see that in England surgery was fostered in its infancy by municipal rules rather than by state laws or charters. The facts concerning the *master surgeons* of the city of London point out emphatically that there were then professors of the art who were not mere barbers, and there is a military instance proving that these were in high repute.

In the year 1344 Robert, Count of Artois, conducted an English army in Brittany, and took the fortress of Vannes, which was shortly after retaken. Froissart relates—"Sir Robert was sore hurte, and scapped hardly untaken. He taryed a season in Hennebon, and at last he was counsayled to go into England to seke helpe for his hurtes; but he was so sore handled on the sea, that his soores rankeled, and at last landed, and was brought to London, and within a short time after he dyed of the same hurtes and was buried in London in the church of Saynt Paule, with great honour." This instance shews that in 1344 the skill of the master surgeons of London was famed.

Guy de Chauliac, who flourished at Avignon and Lyons in the reign of our Edward III, in classifying the surgeons of his day, states that those who attended the armies were chiefly Germans, who used charms, potions, oils, and wool in their practice; and we have no means of judging whether the English army surgeons were more enlightened or not. It is not likely that they were, as such practice with boiling oil for gun-shot wounds, under the belief of their being poisoned wounds, continued until Ambrose Paré demonstrated the fallacy which had so long occupied the minds of all army surgeons.

There is another military incident of this period, the record of which will be found in Rymer's *Fœdera*, which may be adduced as the first known instance of a medical board to decide the question of capability to serve. It happened after the battle of Poitiers, A.D. 1356, that a question arose between Sir Denys Morbek, Knight, and Bernard de Troyes, Esquire, as to which of them King John of France had surrendered. The issue was left to the ordeal of battle; and before King Edward III departed for France, in 1359, he directed that the disputants should appear before him wherever he might be on the next Candlemas, to fight their duel. Before that arrived, Sir Denys declared himself unable to proceed, and thereon the King's Council ordered a survey of his person, the particulars of which are very clearly reported



in the official document, a letter patent bearing the sign manual. Sir Denys was visited by a knight, the Dean of Lichfield, and two clerks of the chancelry, who recited to him the circumstances of the appeal to arms made by Bernard de Troyes at Sandwich prior to the king's departure into France. To this he replied stating his incapability of following the king, through his illness, which confined him to bed. "And in order to know better the truth that the said Denys did not feign, they caused him to expose his body, arms, hands, and feet, and after seeing these it was the opinion of the surveyors, and also of the notaries, physicians, surgeons, and all others present, that on this account the said Denys was, by his disease in body and limbs, so wasted, broken down, dried up, and debilitated that he could scarcely recover, unless God wrought on him a miracle.

"And the said Denys made oath to the same on the Holy Gospels, and also Master John Paladyn, Mire, and John of Cornhill, Surgeon, examined thereon, swore on their oath on the Holy Gospels, and on their honor, and on peril of their souls, that the said Denys was so enfeebled by the said disease that he could not help himself, nor move foot, leg, arm, or hand without aid."

Concerning this event Barnes states, in his *Life of Edward III* (p. 519), that the French King wished that Sir Denys alone should have the honour of his capture; and the chivalrous Black Prince caused secretly to be delivered to him 2,000 nobles, and (to end this matter once for all) when the next year King Edward had determined the cause in his behalf, the prince gave him 5,000 crowns of gold more as a reward for that service, all prisoners valued above 10,000 crowns belonging not unto him who took them but to the prince.

During the next five years Sir Denys received small sums from the Exchequer, and after his death the widow\* who had nursed him made application to it for the expenses of his last days and burial. Such was the end of a brave soldier, to whom a King of France was said to have given his gauntlet in token of surrender.

The part of the medical profession in this business is interesting to us, as it shews most clearly that about the era of Crecy and Poitiers pro-

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\* *Calendar of State Papers*, Issue Roll of reign of Edward III, an. 37, 3rd March (1364): "To Mary Rous prosecuting at the King's Council the claim of Denys de Morbek, who asserted that whilst he lived that he took John of France in the war at the battle of Poitiers. In money paid to her of the king's gift in aid of her expenses, £3 6s. 8d." N.B.—There are other payments on these rolls relating to this affair.



fessional opinion was made the turning point for decision of a question of military honour and discipline, and that the process was guarded by very strict forms.

With regard to Master John Paladyn, Mire, and John of Cornhill, Surgeon, it may be asked—Were they, or had they been, army surgeons, as they were engaged on this essentially military decision?

Master John Paladyn was styled "our physician" by the king.

John, of Cornhill, was probably a master surgeon of the City of London, like Master Paschal, Master Adam de la Poleterie, and Master Davidde Westmorland, whose names appear in 1354 A.D. I consider it possible that men of that class may have derived their eminence from service with the king's army, just as we know that the great Ambrose Paré—who made for himself, two centuries later, the reputation of Master Surgeon of Europe—divided his time between service in the field and his barber-surgeon's shop in Paris.

Of the state of medical practitioners in London in the reign of Edward III we have the direct evidence of Chaucer, father of English poetry, in his *Canterbury Tales*.

"With us ther was a Doctour of Phisike,  
In all this world ne was ther non him like  
To speke of phisike, and ofurgerie :  
For he was grounden in astronomie.  
He kept his patient a ful gret del  
In houres by his magike naturel.  
Wel coude he fortunen the ascendent  
Of his images for his patient.  
He knew the cause of every maladie,  
Were it of cold, or hote, or moist, or drie,  
And wher engendred, and of what humour,  
He was a veray parfaite practisour.  
The cause yknowe, and of his arm the rote,  
Anon he gave to the sike man his bote."

In this there is the combination of physician, surgeon, and astrologer, who was also a good linguist, skilled in the writings of the ancient Greek and Arabians—a master in science and literature, as well as in medicine and surgery. The moral grandeur of his character, when surrounded by much that was degrading to that of his companions on the pilgrimage, is delicately wrought out in the purport of his exquisitely told tale, where "men may see how sin hath his merite."

"The worm of conscience may agrise  
Of wicked lif, though it so privee be,  
That no man wote thereof sauf God and he."

Whether Chaucer formed this flattering ideal at court or in camp, or in both, we may not find. At the former, Master John Paladyn, the



king's physician, was before him; and in the camp he, as a man of letters, would have associated among such as "speke of physike and of surgerie" from their equality of rank as "vassaletti." His military service seems to have been rendered in 1360 A.D., at the age of thirty-two, when ardent minds are most open to receive lasting impressions, and to form types of character with mental record for later use. The pilgrimage took place in 1383 A.D., and these inimitable types of English mediæval personages were given to the world at a later date. Certainly our profession may take pride in Chaucer's ideal attributes, as they show, at least, the respect in which its professors stood in his day; and military surgeons may assume that men of that stamp then served in war, and that Chaucer may have discovered his type among them when he was serving in France in 1360.

The next names that come prominently forward in the medical history of our army are those of Master Nichol Colnet, Physician, and Master Thomas Morestede, Surgeon, to King Henry V, who were both present with the king in the great battle of Agincourt. Their engagement to serve marks a grand epoch in military medical affairs, in the formation of a surgical staff entirely under the control of Thomas Morestede.

In preparation for the expedition to France, a new system was inaugurated by indentures or legal instruments drawn up between the king on the one part, and the Dukes of Clarence and York, the Earl of Salisbury, Lord Scrope, and Sir Thomas Tunstal, severally, on the other part, to attend the king with contingents of their vassals and freemen in the war on king's pay. And similar instruments were drawn up between the king and his physician and surgeon to afford him their professional services for one year; the physician to take with him three mounted archers or men-at-arms in his suite; and the surgeon, twelve men of his own profession and three archers likewise.

In Rymer's collection, there are two documents styled "Petitions of Thomas Morestede", which show that difficulties arose both previous and subsequent to the drawing up his indenture. One of these is dateless and unsigned, as if it were the draft of a petition, referred to the Lord High Chamberlain; and from its tenor it would seem to have been preliminary to his indenture of contract to serve with the army about to proceed to France. In it he prays, first, for a Commission under the seal of the Lord High Chancellor, empowering him to impress within the franchises of the City of London, as well as beyond them, those of his calling whom he might wish to select to serve with him in the king's army; 2. For an indenture under the privy seal of



his engagement "to serve in the expedition as a *man-at-arms*, having the same wages, or *wages with regard*, as others of that rank, having in his company fifteen persons, of whom three shall be archers and the others of his calling, each of them having the same wages as archers of the army ; 3. That the indenture with him might be drawn out after the form due to esquires. There are some interesting points in this, tending to prove that the barber-surgeons of London were unwilling to accept service with the army, and that impressment was called for ; that it was contemplated to give the inferior rank of man-at-arms to the chief surgeon, until he stipulated for that of an esquire, which was still much lower than that of knight, borne by the chief surgeon in the army of Edward I, two centuries earlier. It was due to the vigilance and self-respect of Thomas Morestede that these concessions were secured to the surgical staff of the army in the early dawn of our modern profession. He attempted more than this in his second petition, dated within a month of signing the indenture, in which he asked "for money wherewith to purchase and provide medical stores and necessities for the whole duration of the expedition, for the appointment of a staff of orderlies, and for the means of transport."

Of these requests, the last was alone granted ; viz., one car and two pack horses for conveyance of all the requisites of his office, which would seem to have constituted the ambulance of the brave but disease-stricken army that won the battle of Agincourt when despised by the adversary on account of its impoverished and sickly condition. These petitions from Morestede evince his capability as an administrator if the means had been granted him ; but it is even to be feared that at Agincourt the want of surgical instruments, as well as that of surgeons, was felt ; for when the king was about to take a fresh army into France the next summer, he ordered his surgeons, Thomas Morestede and William Bredewardyne, to impress without delay, in the City of London or elsewhere, as many surgeons and makers of surgical instruments as shall be necessary and fit for the expedition, thereby admitting the inadequacy of the provision in the preceding year.

The scale of pay of the army was rated as at Cressy in 1346.

|                        |                     | £ | s. | d. |                  | £   | s. | d. |
|------------------------|---------------------|---|----|----|------------------|-----|----|----|
| For a Duke.....        | <i>per diem</i> ... | 0 | 13 | 4  | <i>per annum</i> | 243 | 16 | 8  |
| „ Count or Earl        | „ ...               | 0 | 6  | 8  | „                | 121 | 3  | 4  |
| „ A Banneret .....     | „ ...               | 0 | 4  | 0  | „                | 73  | 0  | 0  |
| „ A Knight .....       | „ ...               | 0 | 2  | 0  | „                | 36  | 10 | 0  |
| „ A Scutifer (esquire) | „ ...               | 0 | 1  | 0  | „                | 18  | 5  | 0  |
| „ A Mounted Archer     | „ ...               | 0 | 0  | 6  | „                | 9   | 2  | 6  |
| „ A Foot Soldier       | „ ...               | 0 | 0  | 3  | „                | 4   | 11 | 3  |



But for the last grades the scale differed for services in Gascony or France; the above being received, together with rations and forage, whilst in the adversary's territory; and increased pay, without rations or forage, while in the king's dominions in England or Gascony, where a scutifer with four horses received gross pay of forty marks, or £26 : 13 : 4 *per annum*; and a man-at-arms with one horse, £13 : 6 : 8 *per annum, pro ratō*. By comparison of these scales, it may be inferred that the net personal pay for the military services of a scutifer when Agincourt was fought was one shilling, and that of a man-at-arms 6d. a day, that the daily rations of a man were valued at 2d., and the forage of a horse at 1d. a day; but it must be borne in mind that in actual weight of silver the shilling of that time was equal to 2s. 9d. and the penny to 2½d. of ours, and that twelve shillings was the price of a pipe of French wine. The physician Colnet, and the surgeon Morestede covenanted for the pay and allowances of "scutifer" for themselves, and for those of "mounted men-at-arms" for their followers. They all participated likewise in a monetary allowance of 100 marks, or £66 : 13 : 4 to every thirty men, or £2 : 4 : 4½d. per man, quarterly, whilst serving in the enemy's territory.

For the gains of war in booty and ransom, their covenants were the same as those of all the leaders, excepting the Duke of Clarence, in whose indenture ransoms are not mentioned. Of all booty, one-third was the king's, together with all gold, silver, or jewels exceeding the value of ten marks—£6 : 13 : 4; and should the physician or surgeon or any of their suite capture a king or any princes, or chiefs, they were to be given up to the king, who should make reasonable satisfaction to the captors.

It is worthy of point that these covenants for military services were made only with the great leaders and the chiefs of the medical staff, who were made the receivers of the wages of all their followers for distribution, and each held a deposit of the king's jewels as security for pay. This was not acquitted so punctually by our Plantagenet kings as it is in our day, as we read in Sir E. Ellis's *Historical Letters* (vol. i, 2nd ser., Letter xxxi) that in 1423, a year after the death of Henry V, Sir Thomas Rokeby petitioned the Duke of Gloucester, Protector, and the King's Council, "that by endenture, he went to France with his retinue in the 4th year of the reign of Henry V (A.D. 1417) for a yere, and was detained there from yere to yere until four yeres was nere spended and passed, for the whilk time a great part of the wages is behind and nowth paid him to his great hindering and annentifying."



His petition was granted. Let us hope that, if Thomas Morestede and men of his calling were detained thus from their barber-chirurgeons' shops in the City of London, they were treated better than Sir Thomas Rokeby was.

Morestede was an eminent member of our profession ; he was Surgeon to three of our kings—Henry IV, V, and VI—and, as Henry V died of some surgical malady, it is probable that he was then in attendance on him at Vincennes, A.D. 1422.

Morestede retained his influence at court after the restoration of the House of York, as we find that in the first year of the reign of Edward IV, A.D. 1461, a charter of incorporation was granted to the barber-surgeons of London, securing to them corporate rights under the protection of the medical Saints Cosmo and Damien ; and this was effected through the influence of Thomas Morestede, surgeon, and Jaques Fries or Fryle, and William Hobbes, physicians, who served in the army of Edward IV.

Now, as this charter of incorporation of the barbers of London was the progenitor of all subsequent charters to the companies of Barber-Surgeons (Henry VIII), Surgeons (George II), and College of Surgeons (George III), it may be asserted that Thomas Morestede, chief of the surgical staff at Agincourt, used his influence at court beneficially to the profession in its surgical branch.

I have not found any particulars relating to my subject in the reign of Henry VI, when large armies were kept up in France.

With regard to the medical staff of the army in the reign of Edward IV, Grose informs us (at page 239, vol. i), on the authority of an original indenture in the State Paper Office, that in the fourteenth year of his reign, A.D. 1475, the following physicians and surgeons engaged to serve in Normandy and France for one year :

Master Jacobus Fryle (Qy. Fries), king's physician, for wages of 2s. *per diem*, and two servants at 6d. *per diem* for each.

Master William Hobbes, physician and surgeon of the king's body, for 1s. 6d. *per diem*.

Surgeons, every one at 12d. a day : Richard Felde, Richard Elstie, John Smith, Richard Brightmore, Thomas Colard, Richard Chambre, and Simon Coll.

Other surgeons at 6d. *per diem*, for their attendance in the same service beyond the sea ; William Coke, Richard Smythys, John Stanley, John Denyse, and Alexander Ledell.

Grose notices it as remarkable in its being the same number as the



medical staff that went to France with Henry V. It is as noticeable, also, that the pay of the chief surgeon was increased from 1s. to 1s. 6d. a day, and that of the twelve surgeons serving under him, seven were paid 1s. a day like the chief surgeon of Henry V's army. This was after the lapse of half a century since the battle of Agincourt. The expedition achieved no glory, and returned after exacting a large sum of money from the King of France. For the first time the inferior officers of the medical staff were placed in two divisions, which may be regarded as the prototypes of the surgeons and surgeon's mates of a later period. Of these the first seven were paid the same wages as the chief surgeon serving at Agincourt, and the five juniors the same as his assistants had been paid.

To complete the main object of this paper, I recapitulate the names of military medical men that have appeared on the pages of the history of our country prior to the accession of the House of Tudor.

A.D. 43.—Scribonianus Largus, who attended on the Emperor Claudius in his campaign in Britain.

A.D. ....—Anicius Ingenuus, surgeon of the 1st Cohort of the Tungrian Legion, who died at Chester-in-the-Wall.

These are connected with the Roman period of the history of Britain.

A.D. 1066.—Gilbert Maminot, presbyter and medicus, and Nigellus, medicus, who came over with William the Conqueror.

A.D. 1299-1300.—John de Kenle, physicus; Philip de Belvaco, chirurgicus; John de Shireburn, William de Rigethorne, physici-adjutores; Edmund de Baunton, and another, chirurgici-adjutores; who composed the medical staff in the invasion of Scotland under Edward I.

A.D. 1415.—Nicol Colnet, physicus; Thomas Morestede, chirurgicus, with twelve coadjutors—names unknown—who composed the surgical staff present at the battle of Agincourt, A.D. 1415.

A.D. 1416.—Thomas Morestede and William Bredewardine, who were the chief surgeons of the army in France, having under them as many junior surgeons as they considered to be required.

A.D. 1475.—Master James Fryle, physician; Master William Hobbes, physician and surgeon, with a staff of twelve surgeons, whose names are given on the preceding page.



## APPENDIX A.

*POSSESSIONS OF NIGELLUS, MEDICUS.*

As *tenant in capite* he had twenty-three holdings direct from the crown. Of these, six lay in Wiltshire, one of them, Stratone, having not less than 3,000 acres; ten in Herefordshire, one of which was free from tax bestowed "*servitio regis*;" two in each, Shropshire and Worcester; and one in each, Kent, Somerset, and Gloucester. From all save one a rental was due to the crown, and out of them Nigellus endowed the church of St. Marie de Monteburg, near Cherbourg, with an estate of 500 acres in Somerset, "*ex dono Nigelli*," besides making that church tenant of 400 acres in Wilts. Several of his estates were church-lands, and others had belonged to Spirtes, the ecclesiastic, who was banished by Edward the Confessor after having been his favourite; not less than sixteen of them possessed demesne-lands, and four lay near towns, Dover, Gloucester, Wich in Worcester, and Awnebury in Hereford.

In addition to the manor houses and demesne-lands, there were eighty-three farms with outhouses and tenements for labourers, eight mills, and about sixty cottages, all having proportionate arable lands and pasturages; and there were also salt-pits, fisheries and ponds, enclosures for capturing wild animals, and rights of fattening swine in the forests. In total, there were about eighty hides or 8,000 acres of taxable land, held by Nigellus from the crown, and this was generally of excellent quality, judging from the number of ox-teams employed in ploughing, together with the frequent references to pastures. It appears, likewise, that in addition to those crown-lands, held by him in chief, he was possessed of four estates of nearly 1,800 acres in Shropshire allotted him in fee by Count Roger de Montgomery.

Perhaps since his day no medical practitioner has ever held so many broad acres of English soil. Certainly the donors had acquired them easily.

Besides these landed possessions, Nigellus had allotted to him four houses in the town of Southampton. *Domesday Book* records that the crown possessed forty-seven dwellings within the town, and that these were conceded free from taxes, according to custom, to individuals.

The list of these begins with high Norman ecclesiastics, who each retain one house; then follow Norman nobility, with one or two houses each, Count Moreton alone of them holding five, most likely by virtue of his office; then come the names of officials, including Aiulf, chamberlain, four; Turstin, chamberlain, two; Nigellus, medicus,



four ; Stefan, steerman (chief of the shipping), two ; and Turstin, machinator (engineer), two.

As these allotments of houses hold no abstract relation to the rank of the individual it must be inferred that they were regulated according to his function ; thus, the chamberlains having charge of household goods and supplies, and perhaps the entertainment of the king's officers passing to and from Normandy, would require much space, and so also the chief of the shipping and the military machine maker, would do so in their degree, as heads of departments.

But the allotment to Nigellus, medicus, of four houses, when bishops had but one each, would seem to indicate that, in connection with his office, he was provided with accommodation for others, who could have been none other than those requiring medical care, sent away from the army to re-embark and return into Normandy.

If that supposition be correct, there may be assigned to these four houses the character, if not the title, of *the earliest military hospital in Norman England* ; and it seems somewhat strange that after eight centuries there has been built not far from it, at Netley, the principal army hospital of the kingdom for the lodgment of sick and disabled soldiers sent home from the distant possessions of England scattered from Honduras to Japan.

#### APPENDIX B.

##### CONTEMPORARY HISTORIES OF THE WOUND RECEIVED BY PRINCE EDWARD.

THOMAS WIKES, canon of Osney, near Oxford, who lived in the reign of Edward I, writes thus : " Porro familiares \* \* \* de salutis remedio desperantes ; evocati statim medici in arce peritissimi vulnera sua congruo medicamine fomentabant, mundique Redemptor in se credentium qui vera salus est, qui, ut ait Propheta, vere languores nostros tulit et dolores nostros portavit in corpore suo super lignum, tam efficax et optimum gratiæ suæ concessit antidotum, ut vulnera sua quæ cunctorum judicio censebantur incurabilia, modico tempore curarentur."

Walter Hemingford, canon of Gisborough Abbey in Yorkshire, who lived in the reigns of the three Edwards, wrote thus concerning the same event : " Vocantur ergo Chirurgici, et medicamenta imponunt. Sed post dies paucos, videntes denigrescere carnem, mussitaverunt



inter se, nec erat lætitia in populo suo, quod ille perpendens dixit eis : Quid est quod mussitatis, nonne sanari possum? Dicite mihi, nec timeatis. Et ait unus natione Anglus, Curari potes, sed oportet te dura pati. Et ille : Si passus sum, quidem fuero, numquid sanitatem promittis? Et ait : Promitto quidem, et sub poenâ capitis mei. Et ait : Committo ergo me tibi, et expete quæcunque volueris. Et ait : Numquid sunt aliqui ex Magnatibus in quibus confidis? At ille nominavit multos ex circumstantibus. Circumsteterunt enim eum Magnates plurimi cum uxore suâ. Et ait duobus primo nominatis, Domino scilicet *Edmundo* et Domino *Johanni de Vescy*; Numquid et vos diligitis Dominum vestrum, et dixerunt utique. Et ait : Tolle ergo mulierem hanc, et non videat Dominus ejus, quousque dixero vobis : Tulerunt ergo eam flentem et ejulantem, et dixerunt : Sine domina, melius est quod tu effundas lachrymas, quam quod lachrymetur tota terra *Anglicana*. Mane autem facto incidit denigratam carnem brachii sui et projecit ex toto, et ait : Confortare, quoniam promitto tibi quod infra xv dies manifestabis te, et equum ascendes. Tenuit quod promisit, et admirati sunt universi."

These authorities are published in Gale's *Rerum Anglicorum Scriptores*, and they are of the highest value as contemporary reports of an event which must have been of the highest national interest. They concur in admitting the gravity of the wound, the extreme solicitude of the prince's followers, and the presence of surgical aid; but with regard to the cure they differ, one assigning it to a divine miracle, and the other imputing it to a surgical operation. It is remarkable that such difference of opinion should have existed between two mediæval ecclesiastics, of whom the latter was evidently a rationalist.

Neither of them entertains the romantic story about the princess Eleanor, and the last even suggests that the surgeon looked on her presence as hurtful to his royal patient. The whole story cannot be read without admiration of the decision and force of character of the English surgeon, and of his confidence in the resources of his art.

#### APPENDIX C.

##### PAY OF MEDICAL STAFF.

TAKING the scales of wages of artificers and labourers at various epochs in the middle ages, there can be no question that military ser-



vices were well requited. The commonest foot soldier received a daily pay equal to that of the working mason, carpenter, or smith; the archer as much as the hind, or manager of a farm; and the mounted archer, or man-at-arms, more than ordinary mass-priests, or household chaplains of the nobility. It is remarkable how little change there was in the scale of pay of the army between the beginning of the fourteenth and the end of the fifteenth centuries. The positive data concerning medical pay are few, being limited to the dates of the invasion of Scotland by Edward I, A.D. 1300; the invasion of France by Edward III, 1346; and the invasion of it by Henry V, 1415.

Of the first what is known applied to the ordinary medical officers of the royal household, with supernumeraries for the occasion as assistants to the physician or surgeon; and concerning their emoluments, I consider that we cannot take those above the assistants as exemplifying the scale of military pay, because their superiors who engaged their services were in receipt of their ordinary wages as courtiers. It is not to be credited that even at that early period there were no others in surgical capacity connected with the army; and, without proofs to the contrary, we may presume that there were such in every feudal baron's contingent, if it were only for the self preservation of the baron. If there were such, their pay and position would probably have been the same as those of the assistants on the royal staff, although there is an incident of the next period that seems to show that being attached to the king's own levy caused a decrease of emolument.

Analysing the medical staff of King Edward I in 1300, it is found that his physician and chief surgeon ranked with knights, drawing £36:10 a year, and clothing money £5:6:8, with forage for four horses; and that the physician at least, if not the surgeon also, was dieted in the household at a valuation of £18:5 a year, raising the physician's emoluments to the value of £50:1:8 a year. As this latter item comes out only incidentally in the wardrobe accounts, there is reason to assume that the king's surgeon was, by custom, entitled to a similar privilege of messing, which would give to each of them an appointment worth £1,250, while without it the surgeon's emoluments were equal to £841:13:4 *per annum* of our standard value of the first half of this century prior to the late increase in price of all the commodities of life. Political economists are agreed on the point that to estimate the comparative value of money on the true basis of what it will purchase, it must be multiplied by twenty-five for the reign of



Edward I, by which the relative values given above are arrived at; and by sixteen for the reign of Henry VI.

But for the reasons assigned, we may set these highest rates aside as not due to simple military services, and rely with perfect safety for that standard on the lower scale of the pay of the "assistants" engaged for the expedition. These ranked with "scutifiers" of the army, or esquires, receiving the pay of £18:5 a year, the equivalent of £456:5 in the first half of this century, and to considerably more at present, with forage for a charger. They were able to maintain their position well on their wages, as, according to Hallam (*History of Middle Ages*, 8th edition, vol. ii, p. 432), "In the reign of Edward I an income of £10 or £20 was reckoned a competent estate for a gentleman". This was an exceptional period, when the medical staff was better paid than at any subsequent period of our military history; and it establishes the most important fact of such an organisation at so early a date. In face of it, it cannot be imagined that the great English armies that conquered in France, were ever allowed to be without some provision for attendance on the sick and wounded. History is dumb on the point, until Henry V was preparing his great expedition, when probably the arrangements made by him were supported on experience rather than guided by records. I have ventured to explain this silence, on the supposition that each baronial contingent had its own medical staff, by private arrangement between its commander and the medical men, nothing whatever being recorded of their contracts with any of their followers. No other reason has been offered that will go so far as this to explain the remarkable circumstance that the great muster-roll of Cressy, which gives the baronial contingents only in aggregate, makes no reference to surgeons, except of a single "medicus" attendant on the Welshmen under command of the Black Prince.

The military affairs of England had not relapsed into the condition of the first Crusade, and it cannot be contended that the armies of Edward III went into the field totally unprovided, as they must have been if nothing is to be believed where history is mute.

It is, indeed, likely enough that, under a system of baronial provision, which was in some measure a subsidiary corps, there would be a falling from the precedents of a former monarch, and this may have been contemporary with a decline in the social position of those who undertook the practice of surgery; still it is proved that in the City of London there were "mires" or physician-surgeons, and master-surgeons as well as barber-surgeons, and their services were procurable, but cer-



tainly not for the wages of fourpence a day, or £6:1:4 a year, specified for the only Welsh medicus referred to on the muster-roll. We are thus driven to the confession of inability to state in what way, from what source, or to what amount, the surgeons who served under Edward III were remunerated.

The third epoch premised is that of Henry V, whose *indentures* with his physician and surgeon to form a medical staff are documents of the highest value, as they form a turning-point, not only in military medical history, but that out of which grew up the scientific and stately profession of surgery of our own day.

The fathers of that profession, who stood round the standards of Henry V and Edward IV unfurled in France, were content with a lower scale of rank and pay than that given by Edward I.

Nicholas Colnet the physician, and Thomas Morestede, the chief surgeon in the field of Agincourt, held the rank of *esquires* only; each had a body-guard of three mounted archers, and drew the modest pay, while in Gascony, of £26:13:4, the equivalent, by the multiplier sixteen, of £426:13:4 of the first half of this century; and when in the enemy's country they received £27:2:9, the equivalent of £434:4:6, with forage for four horses. And the barber-surgeons of their staff received in Gascony £13:6:8, equal to £213:6:8; and in France £26:13:4, equal to £426:13:4 of our age, together with forage for a horse.

This scale of pay was not a mean one, as Sir John Fortescue, the chief justice, has recorded that in that age "£5 a year, or £90 of our day, was a fair living for a yeoman", a class of whom, to use the words of Hallam, "he is not at all inclined to diminish the importance".

After sixty years had elapsed since Agincourt was fought, when Edward IV invaded France, there was a rise in the pay of the medical staff, from whose *indenture* we learn that the physician received wages of £36:10, the equivalent of £582; the chief surgeon, £27:7:6, equal to £438; the senior assistants, £18:5, equal to £292; and the juniors, £9:2:6, the same as £146 of the first half of the nineteenth century, showing a striking resemblance to the rates of wages of the deputy-inspectors-general, the staff-surgeons, and the junior surgeons of the army in our day; that of the assistant-surgeons alone having undergone any marked increase relatively to what was paid the young barber-surgeons of the reign of Edward IV.

In addition to these wages, each was entitled, in the enemy's coun-



try, to a "regard" at the rate of £8 : 17 : 9 a year or £142 : 4 of our currency.

Between the reigns of Edward I and Henry V there was a decided decrease in the wages or daily pay of the medical staff, but that seems to have been compensated by the *regard* given when in the field, established by Edward III.

The whole evidence is to the effect that the daily pay remains, comparatively, the same as it was in the days of Edward IV. The gain to the medical staff has been in another direction, by the institution of half-pay when unemployed or temporarily disabled, of retired pay when unfit, and of pensions to widows and children, none of which existed at that time. These are contingencies from which all may not derive benefit; but they are inseparable from a permanent military service, and they have to be provided for by keeping down the *daily wages* as nearly as possible to the ancient standards.

#### APPENDIX D.

##### REGARDS, OR REWARDS AND OTHER ALLOWANCES IN ADDITION TO DAILY PAY.

GROSE states (at page 284, vol. i), "Besides the daily pay there was an additional *douceur* styled *regards*—this was a kind of perquisite to the commanding officer, or chief contractor with the crown, for every body of men, to enable them to keep a table for their officers, and to provide for the different contingent expenses. The quantum of this allowance differed according to the nature of the service or country in which the troops were to be employed; the usual sum was at the rate of 100 marks per quarter for every thirty men-at-arms, which amounted to nearly sixpence a day each. Sometimes we meet with a stipulation for a regard and a half, and sometimes for double regards and double wages."

This then, I conceive, may have been the financial margin out of which the baron or "commanding officer" may have paid the entire wages of the surgeons attached to his contingent or, *in part*, by private agreement, if they were borne on his muster-roll among the men-at-arms without there specifying their special vocation. I am not aware that any direct proof of this can be drawn from any documents relating to the army; but it must be inferred from that magna charta of the



royal navy, the *Black Book of the Admiralty*, which compiles the ancient laws and customs of the sea, and then embodies those established by the Inquest of Queneborough held by commission of Edward III in A.D. 1375.

In the sixth article of the more ancient laws it is established that the admiral "shall have for reward of thirty men-at-arms, at the end of each quarter of the year, 100 marks." This had reference to the fighting men or army embarked, being about fivepence three-farthings a day per man of them; while for the mariners there is assigned, by article 10, a smaller reward of sixpence a week to each in addition to their wages.

From this it cannot be doubted that the "regard" was paid in the time of Edward III for all soldiers alike, when embarked for sea service, or on foreign service in an enemy's country; and from the fact of its existence prior to A.D. 1375, it may be believed to have existed for the armies that fought at Crecy and Poitiers in A.D. 1346 and 1356.

Grose makes allusion (at page 240, vol. i) to a customary allowance, without assigning a probable date to its origin. It seems to have been a voluntary gift from the troops to increase the surgeon's wages, and for the purpose of supplying medicines and appliances for their benefit. This practice existed also in the Royal Navy, where it was not discontinued until the year 1805; the navy deriving it from the army.

He writes of it thus. Besides the king's pay, it seems as if the surgeons of former times, as well as those of late, received a weekly stoppage from the private men. This may be gathered from the following description of the duties of a military surgeon written in the time of Queen Elizabeth. "That every souldier, at the paye daye, doe give unto the surgeon 2d., as in tymes past hathe been accustomed to the augmentation of his wages, in consideration whereof, the surgeon ought readilie to employ his industry uppon the soare and wounded souldiers, not intermedlinge with any other cares to them noysome. Regarde that the surgeon bee truely paid his wages and all money due to hym for cures, that by the same hee maye bee able to provide all such stufte as to him is needful."

As this was written in the time of Queen Elizabeth, as a custom of times past, it may be relegated to a period prior to that of the Tudors, when the king's pay was found too small to attract the barber-surgeons of London into the royal services, and it became necessary to impress them.

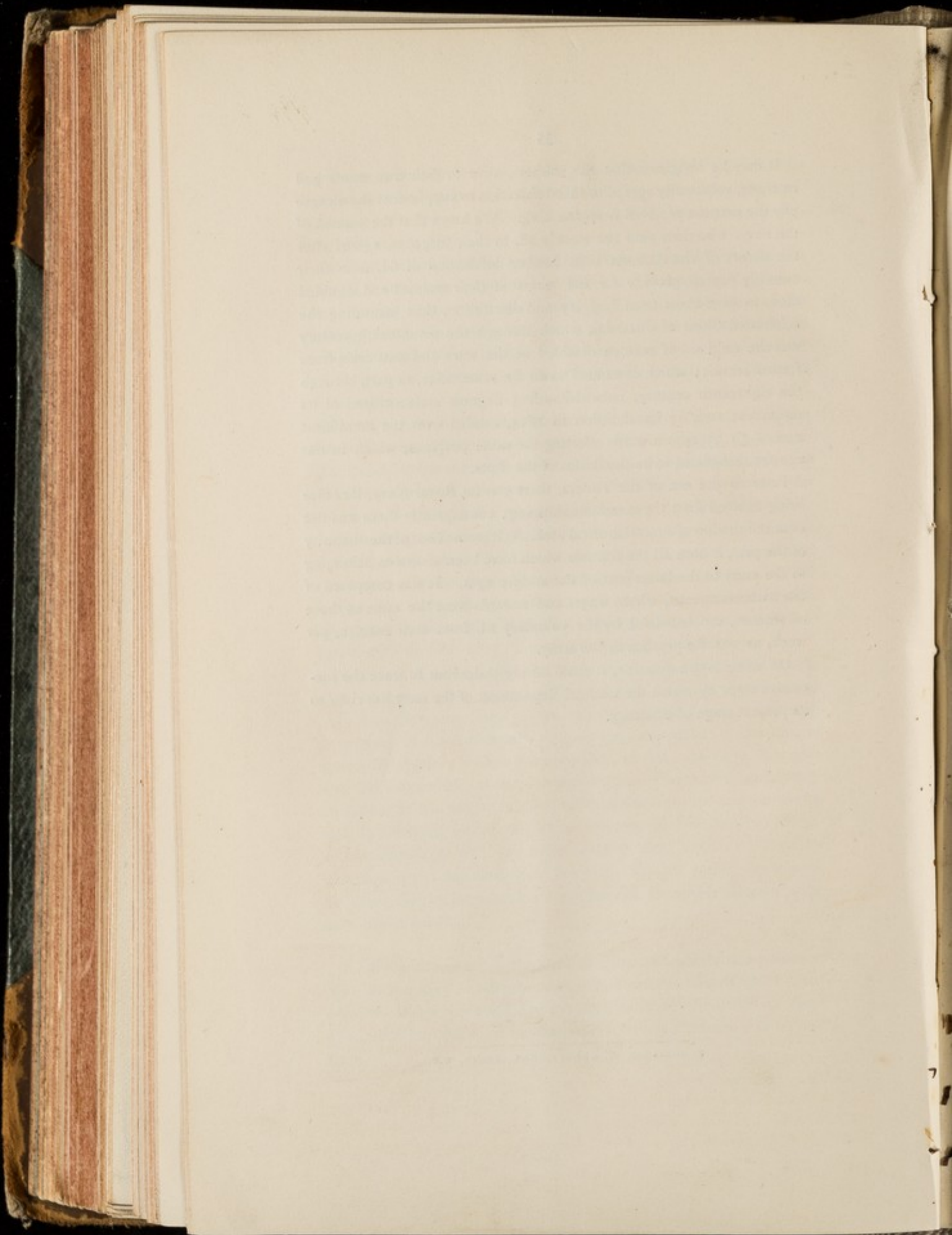


It may be imagined that the soldiers, alive to their own wants and interests, voluntarily agreed to this defalcation to supplement the meagre pay the surgeon received from the king. We know that the seamen of the navy, who then paid the weekly 2d. to their surgeons, agreed after the defeat of the Armada to a further defalcation of 6d. from their monthly pay to provide for the wants of their maimed and disabled men, to save them from beggary and destitution, thus instituting the celebrated Chest at Chatham, which through the seventeenth century was the only aid of seamen disabled in the wars and cast aside from further service; which continued to do the same office, in part, through the eighteenth century, notwithstanding flagrant malversations of its resources; and, on its abolition in 1814, handed over the munificent sum of £1,355,400 towards effecting the same purposes, which in our age are recognised to be the duties of the State.

Prior to the era of the Tudors, there was no Royal Navy, its office being exacted from the merchant shipping; consequently there was not even the shadow of a naval medical staff. As it loomed out of the obscurity of the past, it bore all the features which have been shown as belonging to the army in the latter part of the middle ages. It was composed of the barber-surgeons, whose wages and rewards were the same as those of seamen, supplemented by the voluntary 2d. from each seaman, per week, as was the practice in the army.

On some future occasion, it shall be my endeavour to trace the successive steps by which the medical department of the navy has risen to its present stage of efficiency.







## LECTURE.

Friday, February 13, 1874.

ADMIRAL SIR R. SPENCER ROBINSON, K.C.B., in the Chair.

### ON THE VENTILATION OF SHIPS, ESPECIALLY OF LOW FREEBOARD, AND HOSPITAL SHIPS.

By JOHN DENIS MACDONALD, M.D., F.R.S., Staff-Surgeon, R.N.,  
Assistant-Professor of Naval Hygiene, Netley Medical School.

ON the nomination of the Director-General of the Medical Department of the Navy, and with the sanction of the Admiralty, I have undertaken to deliver a lecture, to the members of this Institution, on the subject of "Ship Ventilation"—a subject which has always been an important one to our Navy, but is more particularly so at the present time, arising from the rapid and extraordinary march of the science of naval architecture of late years, in keeping with the requirements and exigencies of modern warfare.

I presume then it will be quite unnecessary to take up much of your time with preliminary remarks on the hygienic value of wholesome, fresh air, or recall to your minds the catalogue of evils incident, either to its inefficient supply or to its vitiation from any cause. This being conceded, I shall proceed at once to the review of principles, and of such systems as may deserve special notice, referring to any historical matters of interest connected with them; and finally, make some few observations, suggested by the study of the subject, which, I venture to hope, may be of practical utility.

It is usual to divide the sources or means of ventilation into (1) Natural and (2) Artificial.

To the natural category belong, first and especially, the prevailing winds and other aerial currents, which should be aided by wind-sails and air-shafts; and, secondly, those local differences occurring in the specific gravity of neighbouring columns of air, arising from the operation of existing or ordinary conditions, which should be favoured by a suitable arrangement of conduits and uptake cowls.

The artificial means being quite analogous to the natural, may be divided in a similar way, viz.:—first, mechanical propulsion, by rotatory fans, &c., establishing in-, or out-going currents, as the case may be; and, secondly, extraction by heat, applied artificially, and acting through special channels. In addition to these leading principles, we must pay due attention to the ceaseless action of the law of the diffusion of



gases, which is too frequently overlooked by those whose acquaintance with the resources of mechanics may be competent enough in the abstract.

The expansibility and elastic property of common air may be regarded as its intrinsic cause of movement, so as to afford in it an interesting contrast with the blood of animals. Thus the blood, as an incompressible fluid, is circulated through the animal economy by means of the combined contractility and elastic force of the heart and vessels in which it is contained; but the air which it is our object to renew and circulate in circumscribed localities is, in itself, quite elastic and compressible, while the walls of the channels by which it enters or finds its escape, are usually rigid and unyielding. Its elasticity and expansion, moreover, increasing as they do with the temperature, the tension thus induced will naturally render it mobile, so to speak, and determine its movement in that direction in which it finds the least resistance. Here, then, we have an explanation of the ascensional tendency of air contained in the openings between the timbers of wooden ships, or in laterally confined spaces, with an elevation of temperature. Thus, when no aspiratory or propulsive force is in operation, an updraught will be produced by an increase of temperature with a concomitant increase of volume in one portion of air as compared with another in its immediate vicinity. This ascensional force, resulting in ordinary as a spontaneous effect, may be assisted or directed by artificial means, such as the systems proposed by McKinnell and Watson, or the cause itself may be further developed by the direct application of heat, after the system of Sutton, who, availing himself of the galley fire, turned an existing source of caloric to the most economical account.

McKinnell's tube within tube, and Watson's tube divided by a longitudinal septum, as in the shafts of mines, are but slightly different applications of the same principle, the currents passing in opposite directions being concentric in one case, and side by side in the other. They are both intended to favour natural ventilation.

The system of Sutton, on the other hand, is more definitely artificial, heat being specially employed to effect an extractive movement of the air requiring to be withdrawn. It may be well here to compare the relative merits of what has been denominated the plenum principle, and that of extraction just referred to.

When Mr. Sutton was advocating his method of extracting foul air from ships by the agency of heat, Sir Jacob Ackworth the then Surveyor of the Navy put the question, "Do you know how far you are to draw it out?" The answer was, "Only six inches, for, if I can extract it never so small a distance, the incumbent air will press forward of course, and cause a constant change." From that period to the present, the plan of extraction, and the plenum principle so-called, have each had their own supporters, and good authorities are still divided in opinion on the subject. The safest position would seem to be that circumstances alone must suggest the applicability of the one or the other in any particular case. I think, however, it will be admitted that from the very configuration and structure of a ship, the natural mode of



ingress of pure air is through the central part of the body, while the egress of foul air should be lateral. Now this proposition is not at all incompatible with independent lateral modes of ingress, and central channels of egress, which, although holding a secondary place, are nevertheless quite indispensable. The effect of a spring on the cable, with open ports to the wind, and of an axial air tube in a steamer's funnel, would respectively illustrate such cases. We know also that gases diffuse or commingle with a rapidity which is inversely as the square root of their density. Active egress would therefore favour the law of diffusion *without* or outside the body of the vessel, while by active ingress, or plenum ventilation, the exercise of that law is fostered *within*. Moreover, in the former case, the air would be insensibly renewed, while in the latter, cold draught is usually a concomitant. In a moral point of view, it is quite proverbial, that an attractive or drawing force is more effective than a propulsive one, and the same would appear to be the case in the physical world. Thus, for example, it would be easier to suck or draw up a given quantity of water from a depth of 20 feet, than to impel it to a corresponding height. So also it would be easier to extract 1,000 cubic feet of air from the body of a vessel, than to force the same bulk of air into it. The pressure on the contained air would be diminished in one case, so as to induce the ingress of denser air at every opening, while the pressure though increased in the other, would not only more tardily produce the opposite effect, but favour stagnation in the very localities, that would require the most efficient ventilation.

If there is no fallacy in this reasoning, we might conclude that extraction would be preferable to inward propulsion, were we restricted to either. My own feeling, however, is, that no restriction of this kind need exist, and that both may be employed simultaneously when it would be feasible to do so.

The ventilation of circumscribed or inclosed spaces, should be made to imitate mild open air conditions as nearly as possible, and its motto should be "*bonâ fide* perpetual and insensible change."

This is the great desideratum, and I shall now pass on to notice some of the more important systems, proposed or adopted with the view of accomplishing it, commencing with natural ventilation, or, rather the means intended to make it more efficient.

Ventilation by windsails, appears to have been the earliest system in use on board ship, and I am not aware that the precise period of their introduction is known.

They were probably suggested by the observed deflecting power of ordinary sails, more especially when a ship is "on a wind" as nautical men express it. A great volume of air is often sent down through the waist of a ship, from the body of the mainsail, or main trysail, and it is common enough to spread small sheets of canvas, even between decks, to deflect a current of air through a hatch or other convenient opening to ventilate the space below. This principle was known to the ancient Egyptians, from whom the so-called *mulguf*, or wind conductor, has been handed down to the present inhabitants of Cairo, and other neighbouring towns. The mouths of the "mulguf" were so arranged



as to open, at the top of the house in the direction of the prevalent winds.

The windsail in its simplest form consists of a small expansion of canvas spread out to the wind, and connected below with a cylindrical portion, of sufficient length to reach the floor of the space which it is intended to ventilate.

On some unhealthy stations as on the West Coast of Africa, very great length is given to the windsails, with the view of taking the air from a presumably purer stratum than that immediately resting on the water. Figs. 1 and 2, exhibit the two more usual forms of the windsail, viz., the shark's mouth, which requires to be trimmed to the wind; and the fixed form which is so constructed as to receive the wind from whatever direction it may come.

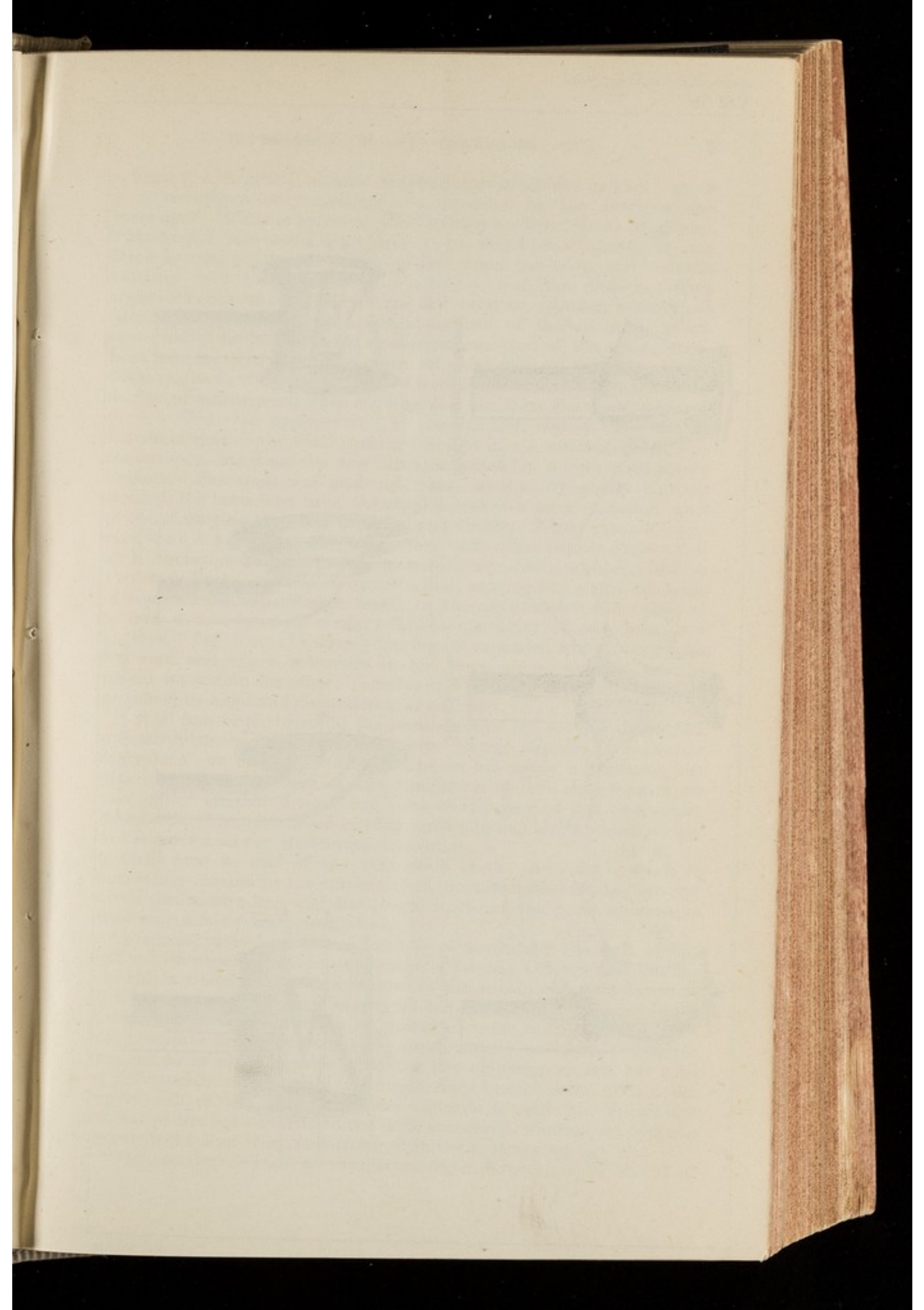
With the high pretensions of this latter, it is scarcely possible that it could be so effective, at any particular time, as the shark's mouth. I have, however, attempted an improvement in it, as is shown in Fig. 3, in which the throat is collapsible, so as to interfere as little as possible with the passage of the air into the shaft. It may be necessary to give the shaft of a windsail, a cunning curvature, when it would otherwise play into the hammocks, and chill the bodies of the sleepers in its vicinity. In some instances, instead of the lower extremity being simply open, it is rounded off, and furnished with numerous perforations, by which means the air is more equably diffused.

The principle of the windsail is also applied in the construction of a receiving cowl and conduit of more rigid material, namely, sheet-iron or copper, which has the advantage of being permanent, and may be used for up, or down draught, as it may be found necessary.

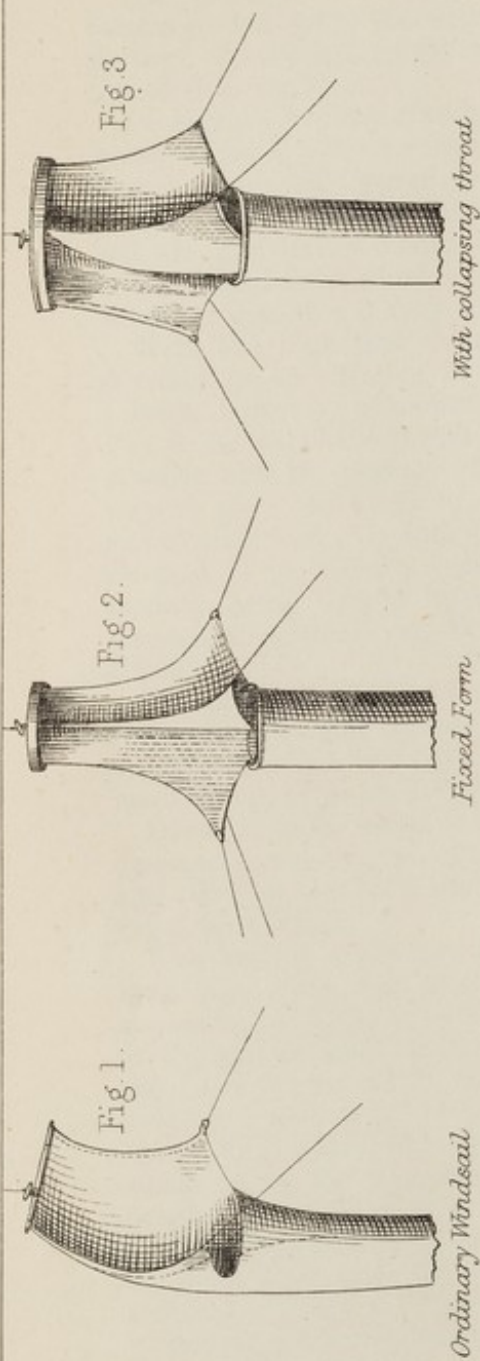
Cowls may be simply *movable*, requiring adjustment by hand, or automatic, needing no interference, being freely versatile on a pivot, and offering the least resistance to the current of air when in the required position.

The known aspiratory effect of ordinary cowls when turned away from the wind, has given rise to numerous modifications of the apparatus, with the object of suiting it to the more efficient discharge of the uptake function alone. In order to comprehend the *rationale* of this function, some little knowledge of the physical properties of common air is necessary. It must be remembered that air is a mobile and elastic fluid, susceptible of very considerable changes in its state and condition by the operation of ordinary and often apparently trifling causes. Its molecules exert an attraction for each other, so that one moving particle would tend to carry other neighbouring particles with it; and those laws by which any disturbance in the equilibrium is restored, exhibit a proportionate power in the reaction. It is thus subject to mechanical movement, friction, stagnation, compression, and rarefaction more or less approaching a vacuum. Now when this latter condition is induced by artificial means, which is only another way of expressing natural means wielded by art, we avail ourselves of the movement, originating in the effort to restore equilibrium, in connection with the mutual attraction of contiguous particles already mentioned.











Figs. 4, 5, 6, and 7, exhibit several forms of uptake cowls. Fig. 4 is apparently a very excellent one, invented by Mr. Boyle a few years ago. It was supplied to Her Majesty's ships "Lord Warden," "Monarch," and others for trial. In the former vessel, it was fitted to one of the air-shafts opening upon the poop, and communicating with the bread-room, shaft-alley, and the limbers. This apparatus consists of a short horizontal tube or cylinder, resting and admitting of rotation upon the upper end of the air-shaft, which opens into it below. But the most ingenious part of the arrangement is an infolded conical curtain, with an axial cone of metal so placed within it, as to allow the air to pass from apex to base, under a certain degree of compression, thus eliciting the air from the shaft, which is carried off at the opposite end of the cylinder, with a force proportionate to that of the wind rushing through it. A small model of this contrivance, exhibited by the inventor, acted in a very satisfactory manner. The shaft was made of glass, so that by gently blowing through the horizontal tube, the rapid ascent of a piece of cotton wool placed loosely on the hand was rendered visible. I may remark, however, that I have seen the same effect with other models constructed for a similar purpose, and must agree with my distinguished colleague Professor Parkes, who is of opinion, that, nothing but a critical series of comparative experiments tested by the anemometer, can enable us to form a just estimate of the relative superiority of one form over another. Fig. 5 acts by simply turning its expanded mouth away from the wind, and Fig. 6 resembles it, but there are several bell mouths placed one within the other. Lastly, in Fig. 7 the aspiratory effect is produced by axial and circumferential currents.

I shall now briefly describe the ventilation of the several decks and compartments of Her Majesty's ship "Lord Warden," as a fair example of an ordinary ironclad. As in too many other cases, the more important features of the ventilation of this ship formed no part of her original design, but were chiefly carried out by Captain Brandreth, R.N., and the dockyard authorities at Malta, subsequently to her arrival on the Mediterranean Station.

Little need be said of the ventilation of the main deck, which is sufficiently insured by the ample size of the numerous hatches, fore and aft in the middle line, and the lateral inlets of the ports, so long as they may safely remain open at sea.

A considerable ascensional force is generated by the heat of the galleys, of which there are two, viz., one for the Officers and one for the ship's company. A large volume of air within the funnel-casings is also constantly moving upwards while under steam. It is important to remember that the plates or sashes of these casings, where they communicate with the decks of ships, usually move on transverse pinions, so as to be capable of taking two oblique positions, but with a difference in the course of the air-currents in each case. When the upper half of the sash is pressed inwards towards the funnel the ascent of the heated air from the deck is secured, whereas an opposite result will follow when it is trimmed in the contrary way.

The excellent scheme of ventilation devised by Arnot for the Field



Lane Ragged Schools has been adopted to some extent in the "Lord Warden," "Royal Oak," and several other ironclads. Thus, a number of stout copper tubes, with curved necks and bell mouths, are distributed at stated intervals along either side of the upper and poop decks. These tubes open flush between the beams of the lower deck over the mess and sleeping places of the men. But, where cabins are built, they extend lower down, and give off lateral branches, which pierce the contiguous bulkheads, so as to supply two or more compartments, either by their free ends or suitable openings made in their sides. To obviate the draught-like current of air naturally resulting from this arrangement, the extremities of the tubes are turned slightly upwards. By this means the air simply overflows into the surrounding space.

Since the arrival of the "Lord Warden" at Malta, ample and well-protected openings were made through the decks with good effect, wherever it was feasible to do so. Two of these ventilate the after part of the ward-room, which was formerly a *cul de sac*, and was frequently very close when the mess servants were employed there. Others, of similar size, bring the engineer's berth and the gun-room into communication with the main deck; these compartments being also ventilated from the upper deck by cowls and air shafts. Nevertheless, it is obvious that, in the arrangements spoken of, one deck must be benefited at the expense of another, which I maintain need never be the case, if the provision of proper channels for the escape of foul air is made in the original design of the ship.

Captain Brandreth, taking advantage of the strong currents of air usually entering the bow-ports on the main deck, placed a large cowl on either side, so as to deflect it downwards to the lower deck, or even to the fore store-room, a locality much requiring ventilation in most ships.

The removal of foul air from the lower deck is assisted by side-shafts or channels running beneath the beams, and opening into the three hollow masts, and into the fore and after funnel-casings, all of which materially favour the up-draught from below.

A single cowl just in front of the foremast, surmounts a tube which descends to the fore store-room, where it divides into two branches to supply the prison cells, which are thus rather better ventilated than the surrounding space.

The carpenter's and gunner's store-rooms receive a good supply of air from two ample cowls on the top-gallant forecastle.

The magazines (fore and after), are ventilated on Captain Jerningham's plan with rotatory fans and tubular down-takes opening upon the floors from beneath; and there can be no doubt that extraction would, in this case, be preferable to the plenum principle. Dust is raised in clouds, and the pressure must be very considerable under existing circumstances. The magazines in most ships are now ventilated in this way, and the system obviously demands a radical change.

Fresh air is conveyed to the bread-room through a valve-door opening in one of the two square air-shafts descending from the poop;



the equivalent valve in the other shaft acting as an outlet for impure air. The starboard shaft, moreover, passes down with the necessary curvature to the limber on the corresponding side of the screw-bed, while the port one terminates simply at the roof of the alley. By throwing back both valves in the bread-room, it will be seen that all communication with the lower parts of the ship will be cut off, and while this is the case, the smell of biscuit imbuing the hot air is often offensively strong at the mouth of the up-take cowl.

The bilge air finds access to the furnaces, and the two large tubes by which the ash-buckets are brought up from the stokehold act most efficiently as ventilators—one usually acting as an uptake, while the other discharges an opposite function.

By an ingenious contrivance, also, the foul air of the stokehold is carried up through a tube in the axis of each funnel, a powerful draught being generated by the surrounding heat. Since this improvement was effected, the temperature of the stokehold under full steam is known to have fallen as many as  $40^{\circ}$  in certain places.

Finally, by the judicious arrangement of septa or curtains of sheet iron, so as to determine up and down currents on the opposite sides, the ventilation of both engine-room and stokehold has been much improved. I have been thus particular in describing the ordinary means of ship ventilation, that you may be better able to comprehend what a little further exercise of art can do.

Sir Gilbert Blane notices briefly a ventilating appliance, which was fitted to the French frigate "*La Nympe*." This consisted of "a square wooden pipe, of about 9 inches in the side, coming from between decks, running along the side of the ship, and opening over the gunwale of the fore-castle." The idea appears to have been copied in some of our ships at the time, and we read of the substitution of metal for wooden tubes subsequently. A comparative estimate of its utility may be formed from some further remarks of the same author. Thus, a "better contrivance than this," he says, "has lately been adopted on board some hospital and prison ships. It consists in an aperture made in the middle of the deck overhead, 3 feet long by  $1\frac{1}{2}$  wide, from whence a tube ascends, tapering into the open air about 6 feet above the upper deck; and to prevent strong currents of air from descending, a screen is made to traverse with the wind by means of a vane, so as to keep the opening to leeward of it."

In the further history of this interesting subject, we have to notice some of the more important schemes or means of artificial ventilation.

During the greater part of the last century the hygienic requirements of the Houses of Lords and Commons seem to have given a considerable impulse, though of a remitting kind, to the whole subject of ventilation, whether applied to public buildings, private dwellings, or ships.

From the ventilation of the House of Commons, and originating with a single individual, the celebrated Dr. Desagulier, we may be said to have derived two of our present leading agencies in ship-ventilation, namely, the extracting power of heat, and the rotatory fan. True, indeed, Mr. Sutton, apparently without any knowledge of Desagulier's previous



application of heat as an extracting force in the case of the House of Commons, conceived and applied his idea of utilizing the heat of the galley in a similar way for the ventilation of ships. Thus, the name of Sutton is more commonly associated with this principle, while Desagulier remains the indefeasible inventor of the rotatory fan. Both systems were strongly advocated by their respective authors at a time that we were fitting out an expedition against the Spaniards, and when the sad deficiency of the ventilation of our ships of war alarmed the Government by its serious effect upon the health of the troops embarked at Spithead.

To the labours of a philosopher, Dr. Desagulier, and a brewer, Mr. Samuel Sutton, we must add those of a divine, the Rev. Dr. Hales, F.R.S., who brought into the field of competition a large double-acting apparatus, on the bellows principle. It consisted of two elongated boxes having valvular openings and a movable diaphragm within; to this he gave the appellation of the "ship's lungs," extravagantly overrating its effects. As Mr. Tomlinson has given a very circumstantial and humorous account of this whole story, I must refer you to his excellent little work on "Warming and Ventilation" for particulars, which my limited time will not permit me to introduce here.

In reference to the ventilation of hospital and prison ships, I have now to propose and describe to you, a system which I am quite sure you will recognise to be one of great importance, not only to Government vessels, but also to our Merchant Marine in general.

Those who are acquainted with even the rudiments of the structure of wooden ships will readily perceive, when their attention is directed to the subject, what a large amount of air space, available for the purpose of ventilation is included between the outer and inner planking and the timbers of the hull. Here, as by a kind of necessity associated with the nature of the materials of which the fabric is built, a great auxiliary to the general ventilation has always been at hand, but, strange to say, never, up to a comparatively recent period, has it been turned to any satisfactory account. When Dr. Reed employed the principle of extraction (by means of a large central shaft furnished with a rotatory fan) to ventilate the ships of the Niger Expedition, downward currents were established in the openings between the timbers. At a subsequent period, the late Dr. Edmonds, R.N., obtained the same result by the agency of heat. Now the natural ascensional tendency of the air in the openings to which I refer, is at variance with both these systems, and is evidenced by the escape of bilge air when their operation is arrested altogether, or is even much enfeebled.

As far as my own suggestions are concerned, the simple statement of the case is this, that under existing circumstances, while much valuable space is lost instead of turning it to good account, ascending currents of impure air are constantly rolling into the cabins of the officers, and the sleeping places of the men, to mix with air, already contaminated with the products of respiration, combustion, &c., and for the escape of which, no rational provision is made. I hope this statement is not overdrawn. I can only say that it is quite in accord-



ance with my own experience, and, in any case, it will serve to point out to us the evils requiring correction, and the obstacles to natural ventilation which should be amenable to art.

I have, elsewhere,\* laid some stress on the importance of establishing a free and perfect circulation of air, at least, in the vertical direction, between the outer and inner planking of the sides of wooden ships, which might be readily done in the several ways there pointed out, though, of course, this would be more satisfactorily accomplished during the construction of a vessel, than at any subsequently period. Thus, every difficulty might be met at its first appearance, and suitable provision could be made for future contingencies in carrying out the object in view.

Should the further suggestions I have to make on the present occasion be without objection as to their practical application,—and I have every reason to believe them to be so,—an experiment might be made, which has certainly never been fairly tried before.

Seeing the numerous interruptions of the channels between the timbers, that must happen in a Man-of-War by the port-sills, chocks, and fillings for various purposes, I feel quite sure that the ventilation of each deck must be regarded as a separate question. It would also be desirable to encroach as little as possible on the existing space requiring ventilation, by any proposed plan. It therefore occurred to me, that, as iron box-keels and keelsons had already been introduced to answer the purpose of parts requiring great strength, as an essential condition, a hollow iron or box shelf-piece might be substituted for the ordinary one of wood. Thus, without making any noticeable alteration in the normal appearance of the ship's side, either within or without, the great desideratum of a continuous air-tube just below the beam ends, and holding communication with all the openings immediately below it, would be obtained. By inserting chocks of wood in the several openings, at the upper level of each shelf-piece tube, the ventilation, or the removal of the heated air of each deck would be provided for, through the intercostal channels of the next deck above. Moreover, by this arrangement, it would be quite impossible for the foul air of one deck to find its way into another. Indeed, if at any time the up-draught effect were reversed, only pure external air could return to the particular deck concerned, irrespective of those above or below it. (See Figs. 8 and 9.) Thus, then, commencing below the orlop deck, what may be termed the bilge air takes the direction of the arrow winding over the first shelf-piece (which need not be tubular) into the openings above it. The first series of chocks not only arrest the further ascent of the foul air but direct it into the tubular shelf-piece of the lower deck. From the orlop deck the current passes over the shelf-piece of the lower deck to the openings above it, and finally, into the hollow shelf-piece of the main deck, below the second series of chocks. In a similar way the vitiated air is conducted upwards from the lower and main decks. Thus, in an ordinary frigate that might be fitted up as an hospital ship, the air from the bilge space and the three

\* Appendix No. 4. "Health of the Navy for 1867."



succeeding decks would be carried off by eight longitudinal air-shafts, engaging with the intercostal openings, an area equivalent to about one-sixth of that of the solid measurement of the ship's walls or shell. The advantages that may be fairly expected to accrue from the adoption of this scheme may be stated as follows:—

1. The admixture of bilge-air with that of the orlop deck is rendered nearly impossible by its continual removal through the shelf-tube of the lower deck, leaving but little scope for the operation of the law of diffusion.

2. The bilge-air being carried away by the shelf-tube of the lower deck is effectually cut off from intrusion upon any other deck.

3. The air ascending from each of the succeeding decks is separately eliminated, without any possibility of commingling by reversal of the currents or otherwise.

4. As a corollary, the pouring forth of foul air from the lower parts of the ship into the living and sleeping places of the Officers and men would be entirely prevented.

5. The extracting power would be exerted upon the mass of air just beneath, or between the beams, where the products of respiration and other impurities naturally accumulate, while its place would be taken up by purer air.

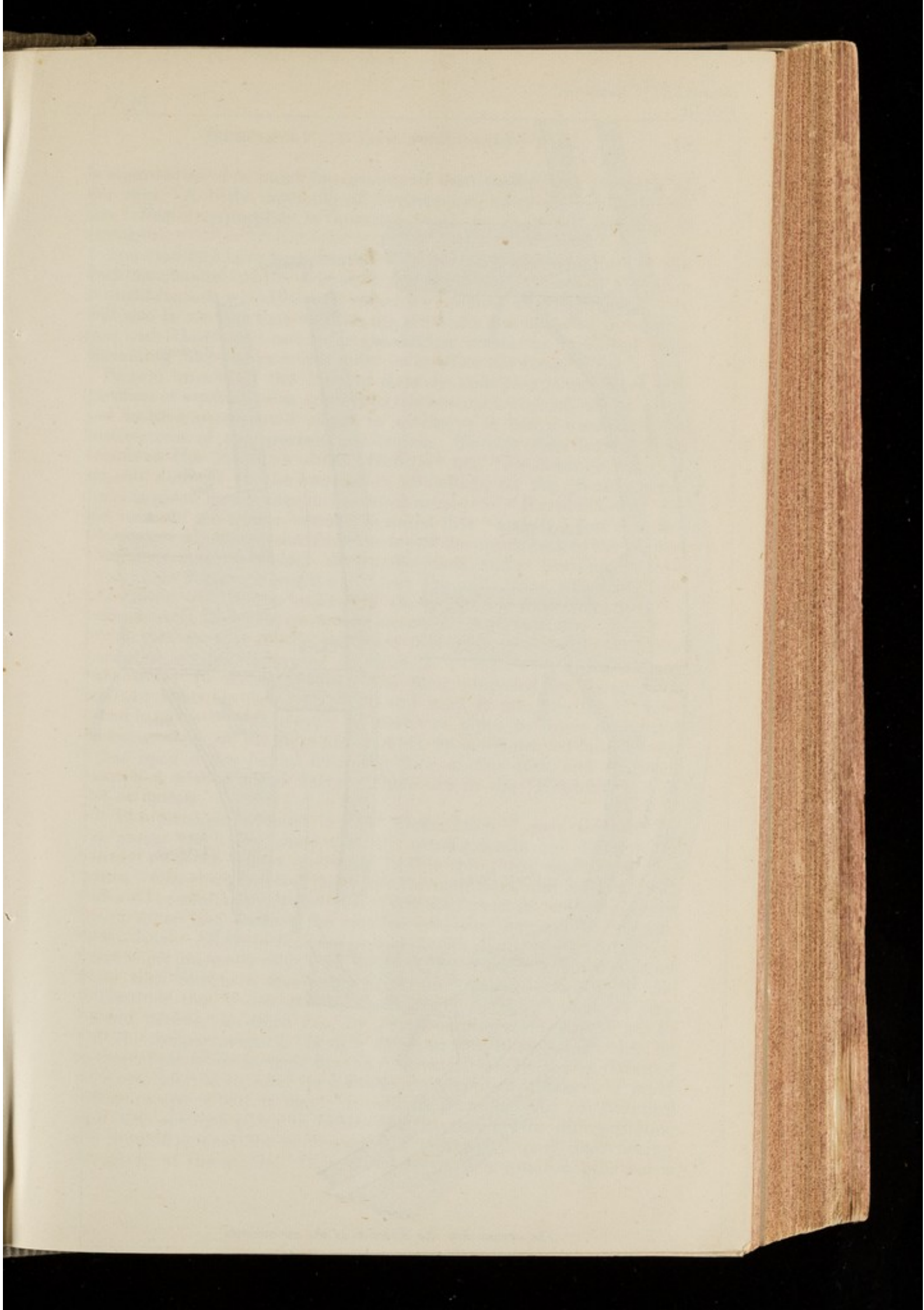
6. No stagnation of air could happen in any part of the shell, so as to favour the tenacity of infection; under which circumstances, also, fumigation would be always more effective than it is usually found to be.

In the application of this principle to iron ships, any difficulties that may prevent themselves would certainly not be insuperable to the practical constructor in whose hands, even the most stubborn materials become plastic, when his purpose is once inspired to carry out an object in view.

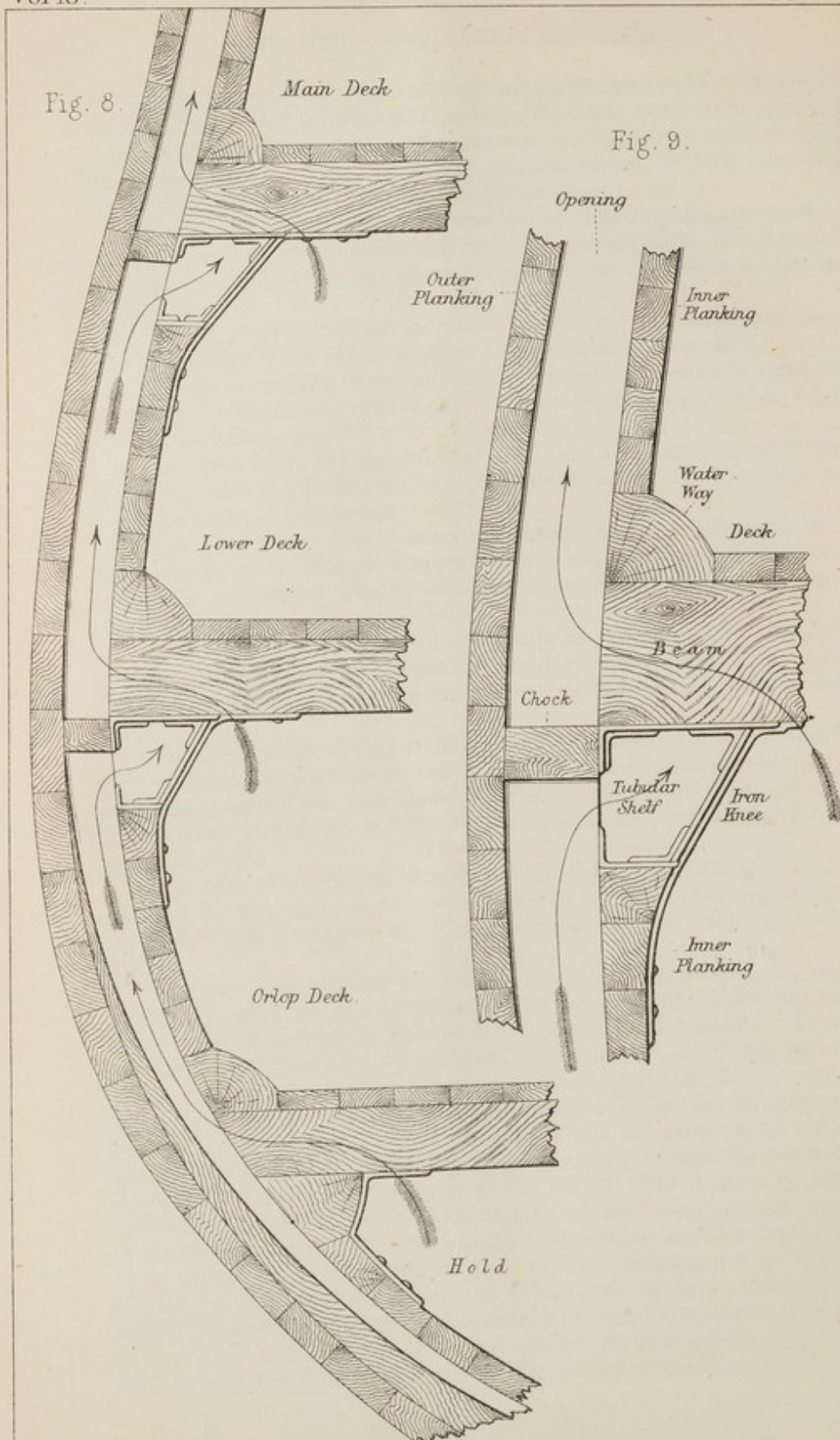
In the case of iron ships as in those of wood, the extensive surface afforded by the walls of the vessel would suggest that a similar advantage might be taken of it for the more efficient ventilation of the hull.

Whatever may be the material of which a ship is built, no locality would appear to be so well suited for the removal of vitiated air as the angle beneath each deck, just where it joins the ship's side. This fact simplifies our idea of ship ventilation very much, for if there were 50 decks, vitiated air would take up the same position in all. In iron ships, however, the office of iron knees and shelf-pieces is superseded by the buttress-like ends of the beams, which are secured by rivets to the frames, so that the difficulty of running a longitudinal air-tube in the locality referred to, meets us at the outset. But it must be remembered that, in the ordinary mode of forging and forming the buttress of the beams, an angular space is left favourable for the transmission of an air-tube, to which a corresponding form might be given. This tube should receive conduits from the deck below, while in the immediate vicinity should be planned the openings of similar conduits, leading to the air-shaft of the deck above. A second difficulty here presents itself, namely the perforation of stringer plates, the integrity of which









The arrows shew the direction of the air currents.



is regarded as of so much importance to the longitudinal strength of the ship. A little ingenuity of construction, however, would, doubtless, effect the purpose in question, with no material sacrifice of strength.

The system I have just detailed together with the adoption of the deck air-channels of Dr. Edmonds, and the intelligent use of all other available means would be well suited for hospital or prison ships. It will also be obvious that whether the air-shafts are made to communicate with the funnel-casing or the hollow masts, or furnished with extracting fans, the principle must be in effect the same.

Should vessels of the Monitor class be multiplied in our Navy, the question of ventilation as applied to the circumstances of closed ports and hatches, necessitated either in action or in heavy weather, must become one of the greatest importance. To this class belong such vessels as Her Majesty's ships "Glatton" and "Devastation," a good general account of the ventilation of which, on the plenum principle, is given by a writer in the April number of "Naval Science" for last year. Of the former vessel it is stated that "a shaft 5 feet 6 inches by 6 feet 4 inches, is sent from the top of the upper deck to the level of the main deck just abaft the smoke stack, and is continued above the upper deck to a height of 12 feet, the walls being rifle proof, and furnished with doors leading to the upper and first decks, both of which must, however, always be closed in rough weather.

"At the bottom of the shaft are four fans, connected with two transverse tubes, the upper of which is 16 inches by 12 inches, and the lower 16 inches square. The fans, propelled by the engine, collect fresh air from the shaft and send it into the tubes, from which latter it is conveyed by means of pipes to every cabin and compartment of the ship, fore and aft, by goose-necked funnel ends, that open a few inches from the floor of the deck, and are each supplied with a screw valve. There are in the 'Glatton' 133 of these outlets.

"The principle adopted in the 'Devastation,'" says this writer, "is pretty much the same, but the arrangements are different in many respects. Thus, there are in this ship three shafts and five fans. One shaft is fixed just abaft the mainmast, and has two fans. The other shafts are placed just abaft the foremast, and are close to each other, but distinct, the smaller enclosing one, and the larger, two, fans. All these fans are provided with distinct sets of engines, and work independently; but it is an important arrangement, and one that contrasts favourably with the system adopted in the 'Glatton,' that if one or two shafts are blocked, or otherwise rendered useless, the third can, by intercommunication, supply air to all the compartments." It only now remains to be stated that, as no special provision is made for the removal of vitiated air in either of the ships referred to, after its more or less complete diffusion, it must find its escape as best it may. It will be seen that the constructors have been at much pains to isolate the function of the different fans, and provide against the contingency of injury to a part interrupting the action of the whole. It is, however, quite a question whether a



very effective ventilation could not be maintained, even without the rotatory fans, if only a fair channel of escape could be made for the impure and expanded air. The whole subject is, indeed, so new, and involving, as it does, considerations upon which good authorities are yet at issue, that I would approach with caution any criticism as to the detail of the system carried out in the ventilation of our low freeboard ships. What I have further to say, therefore, must deal with general principles.

In devising the arrangement of tubes for the supply of air on the plenum principle by means of propulsion, at least five essential particulars must be taken into account:—

1. The manner in which the external air is conveyed to the axis of the fans.
2. The size of the original shaft in relation to the required supply.
3. The number of divisions and subdivisions of that shaft.
4. The angle at which these divisions and subdivisions are given off.
5. The calibre of these latter as compared with that of the primary trunk.

The full consideration of these several points would take up more time than I have at my disposal at present, but they would form good subject matter for discussion. In conclusion, therefore, I shall only repeat my conviction, that the system of extraction would be found to be much more satisfactory than the plenum principle, as applied to the ventilation of our low freeboard ships.

I WILL now, with your permission, call attention to these diagrams. In this one, representing an athwart ship vertical section of the "Hercules," we have the double bottom laid open, the ventilation of which is a desideratum. This is the "Warrior," the first of our iron vessels made with large perforations in the frames to reduce the weight, a purpose which is carried out in a much more satisfactory way by the bracket-plate system introduced by Mr. Reed. Here we have a mixture of the longitudinal and transverse systems of framing, the frames and longitudinal dividing the bottom into compartments. Some use may, perhaps, be made of the wing passages for the purpose of ventilation, but in what way this may be done, has yet to be considered. A very considerable space may be used for that purpose. The "Lord Warden" is a wood-built ironclad, so called. Four and a half-inch plate was considered to be quite sufficient to repel shell at the time the "Warrior" was built, but as improvements in gunnery went on, additions to the thickness of the plate were found necessary, and an inch and a half plate was placed between the outer planking and the timbers in the "Lord Warden." This vessel was built solid, and is literally three times as strong as a ship with channels between the timbers. But still several of these were kept open and in communication with the bilge. This, a radical defect, the oldest and most persistent evil connected with wooden ships, actually exists in the "Lord Warden." Though in many instances the channels alluded to are preserved for the purpose of ventilating the walls of the vessel, they can only do so by pouring mephitic air into the officers' cabins, and into the sleeping space of the men.

In tracing out the different systems of ventilation already followed, I shall direct your attention to these plans on the wall. The upper plan represents the system of Desagulier. The rotatory wheel originally placed by him over the House of Commons in 1736 was rather defective. In the first place, its axis was perfectly central; it had about twelve radiating blades, and the discharge pipe gradually contracted instead of expanding in its course. Now there is great reason to believe that as air tubes are distributed through different parts of a vessel instead of becoming smaller and smaller they should expand in a certain ratio; extraction is also more satisfactorily



effected when the tubes gradually expand, as they diverge from the fan to the body of the vessel. *Here* (pointing) in the modern fan, we have several improvements introduced, by which, with a very much smaller machine, a relatively greater effect is produced, the arms of the fan are less numerous, and the axis is eccentric. *This* is a section seen end on, showing the position of the axis and the hollowing out of the fan blades on each side, near their attachment. The centrifugal force of the fan drives the air with very considerable velocity in the direction of the discharge pipe, and at the same time an in-going current takes place at the axis. It is absolutely necessary that in plenum ventilation this in-going current should be cut off from all communication with the body of the vessel, and pass down from the open air through a tube having direct communication therewith. Subsequently to this, other schemes of ventilation were proposed, viz., Mr. Sutton's and Dr. Hale's, which I have already mentioned.

In the early part of the present century an ingenious contrivance for the ventilation of ships was invented by Mr. Perkins. You will find an excellent account of it in a little work by Dr. Finlayson, R.N., upon the baneful effects of too frequently washing ships' decks, in which a plate of this ventilator is inserted as a frontispiece. You will perceive a tank on each side half filled with water, and communicating with each other across the ship by means of a horizontal pipe. With the upper part of these tanks other tubes are connected, viz., a discharge pipe, and one leading from the bilge, so that as the ship rolls from side to side by the pumping power produced, the bilge air is drawn up into one tank while it is expelled from the other. This principle has lately been carried out in a more satisfactory way by an American invention, under the name of "Thiers' Automatic Bilge Pump and Fog-horn." The system has been adopted in the "Thetis," and in several other ships, and a commission appointed to report upon it gave a favourable account of its operation. The principle is the same as that of Perkins, but with this difference, that Perkins seems to have taken advantage of the pitch as well as the roll. In "Thiers'" plan, the motion is purely lateral, the rolling being taken into consideration. Mr Perkins, on the other hand, placed his tanks obliquely, so that a partial effect might attend the pitch as well as the roll. In Thiers' invention, a tube leads down to the bilge from the upper part of a cylinder placed on each side of the ship, and containing a portion of mercury, both cylinders being connected by a transverse tube. As the ship rolls to port, the mercury ejects the water accumulated on the corresponding cylinder, and conversely when it rolls to starboard the mercury will run along the connecting tube to the other side, and eject the water from the starboard cylinder. By a similar contrivance the bilge air is expelled, water being the moving piston, so to speak.

I have on the table several forms of cowls. The great point giving effect to *this* simple cowl (Fig. 5) is, that the expansion of the mouth is very considerable in proportion to the volume of the tube, seeing that one atom of air in motion will attract other atoms in its vicinity. *This* cowl (Fig. 6) was planned by myself on that principle by invaginating, as it were, a number of conical pieces or lips in this way, and it acts very effectively. In *this* instance (Fig. 7) the outer cylinder confines a portion of the air passing between it and the bell-like expansion of the air shaft, through the back of which another conical portion passes. The aspiratory effect of the circumferential current is such, that the passing air, by its homogeneous cohesion, attracts the air around the circumference of the shaft-mouth, and by the same law, provision is made for the central part of the current to be acted upon.

Mr. Boyle's cowl (Fig. 4) I have already given a description of. There seems much mechanism in it. I have here a model of the scheme proposed in diagrams 8 and 9. Here we have a lower-deck cabin with glass slides, so that you may see the effect of a taper burning in it, and over the shelf-piece of this cabin openings exist communicating with the channels between the timbers. *This* would be an open space, corresponding with the deck above; *here* are the ends of the beams cut off; *here* we have the tubular shelf-piece, and *here* a number of chocks which cut off these channels from all communication with the deck above. By lighting the taper, and placing it inside, we see the ill-effects of a circumscribed space. The light is now dim, owing to the foul air, but by putting an uptake cowl in communication with the tubular shelf, and imitating the motion of the wind by a pair



of bellows, we brighten the light. If you were to substitute a human being for this light, which would be perhaps a very fair thing, because one individual is equivalent to one candle, you will see that he could not live long under such circumstances.

MR. EDWIN CHADWICK, C.B.: I will preface the questions which I am going to ask by a short statement. There was in Paris a gentleman who, of all other men of science, handled the air, if I may so speak, more boldly and successfully than anybody else I have met with; and he contracted to remove vitiated air from hospitals, to introduce fresh air at a given rate of temperature, and to remove it from any part at a given rate of speed. He did whatever was required of him on the principle of aspiration. I would not rely on my own observation, but I would greatly rely on the observation of General Morin, who has thoroughly studied this question. I was informed that in consequence of the great losses that had occurred in the transport of horses to the Crimea, they applied to the Professor, Leon Duvoir Le Blanc, who did this work for hospitals and other edifices, to ventilate ships; and I was told that he had accomplished the same result that was clearly accomplished in the hospitals—introducing air at a given warmth, and removing it at a given speed,—and that it was done with perfect success as to the horses. One cannot follow a lecture like this without plans in hand and a little consideration, but I should like to know from the lecturer what results he conceives are clearly attainable by the present state of knowledge or practice upon this question. Is it such that we can now do what was said to have been done, and indeed actually was done, with respect to the horses, namely, introduce air into any room, and at any temperature you liked, and remove it at a given speed, such as you would prescribe. I should like to know from him if we have attained the same results, and whether we can send down air at a given temperature into the lower parts of the ship, or any part where the ship may be crowded, and remove it at a given speed?

DR. MACDONALD: It can be done if only an order be given to do it. It may be expensive, no doubt. Instead of injecting air into a vessel, I should use extraction in preference, and certainly the amount of horse-power required to throw off, or to extract a certain number of cubic feet per minute, is a matter of simple calculation. You take, first of all, the effective velocity of the fan, which would be, perhaps, three-fourths of the entire velocity of the extremities of the fan. That, multiplied by the sectional area of the opening through which the air passes, will give you the number of cubic feet per minute. Then you have to take the other questions connected with it. Say the effective velocity is 70 feet per minute, then what would be the number of feet through which a heavy body must fall in order to attain the velocity of 70 feet. For 70 feet it comes to about 76.5. You have to multiply this again by the number of pounds. You can reduce the number of cubic feet of air into pounds by dividing by 13, because 13 cubic feet of air is equivalent to a pound. Then the whole result must be divided by 33,000, which is the number of pounds a horse will lift one foot per minute. That calculation could be easily done. Then, of course, if you wish to get warm air in, you must have combustion to effect that, and pass the air over the heating surface.

MR. CHADWICK: This result, it is to be borne in mind, was obtained in Paris, by the principle which General Morin approved, by the principle of suction direct from the chief source of vitiation, and not by fans, simply by means of heating the air of the ascending vitiated flues, at the exit of the tubes, and regulating that heat with skill. That, certainly, was done in the hospital La Riboisière, on a contract to change the air of the hospital, 56 cubic metres per bed, I think, for two sous a day, to keep it at 60°, to change it every hour, which is a rate of warming that we do not attain, with our cheap coal, in England. The Society of Arts have sent to the French naval department for particulars as to what was done with the horses. I may say, about the care of the sister service there, that, although they thought of ventilation, in consequence of the great loss of horses, it did not appear to have occurred to them to be necessary on account of the loss of men.

DR. DE CHAUMONT: I am inclined to think the question of Mr. Chadwick, which has been answered by Dr. Macdonald, is one entirely of expense, and, whether we take up the question of the ventilation of ships, barracks, or hospitals, there can be no doubt the air can be changed sufficiently often, and be warmed sufficiently, if the expense is sanctioned for the purpose. Hitherto, this has been the great



difficulty, and in no case, either in ships, barracks, or hospitals, has the air been changed in anything like the degree necessary to keep up perfect health, either for men or animals. With regard to the method of applying the principles of ventilation, I am quite of the same opinion as those who have already spoken, that extraction is very much superior to propulsion, in every case, and in the case of the Hospital La Ribouisière in France, it was shown that the artificial means of supplying air supplied only 15 per cent. of the whole air, and the remaining 85 was supplied by the natural methods of extraction, which are applicable in almost every case. There are two or three points which we must bear in mind. In paying a visit to the "Devastation," with Dr. Macdonald, I saw the method of ventilating the Officers' cabins, and the method was, that a tube was carried along the upper part of the cabin, with holes perforated in the sides of the tube. The number of holes made was only equal to the sectional area of the tube. This was perfectly insufficient to supply the proper quantity of air in the cabin, because the loss in dividing an air tube into a number of small openings is in the ratio of the square root of the opening. It would be quite easy, therefore, to calculate the quantity of space that would have to be given. If you divide your air tubes into four parts, you lose one half of your available air-space by this process; therefore, whenever a division takes place, there must be a proportionate expansion of the tube. This is a point continually lost sight of, though insisted upon by all the more recent writers on the subject. Then, there is another point that I think has not received proper attention, and that is the very serious effect of angles in tubes. I do not know any work where anything like a formula is laid down on this subject, but, taking a glance at the different diagrams, it seems quite evident that, where you have, in so many cases, a right angle, the air passing down or up must suffer an immense amount of impact on coming to that right angle; that at least one half of it must tend to come to a standstill, and there must be a proportionate loss. It struck me, one might deal with this according to the laws of hydrodynamics, and calculate out the loss that would be found in something the same ratio as the resistance of bodies in water. I think the formula would be met pretty well by a fraction, the numerator of which would be unity and the denominator would be one, plus the square of the sine of the angle the tube would make with the original axis. Where we have a right angle, the amount would be reduced one half, and this table would show the proportionate loss at successive angles.\* (Dr. MACDONALD: The table referred to by Dr. de Chaumont, representing the formula, was left behind, by accident, but that certainly is an approximation to the truth, if not the thing itself.) This point ought to be taken into consideration that, wherever we have an angle, we must use a formula like this, and where we have a subsequent angle, the amount will be the product of the two available results. And if, again, we are to proceed to minor tubes, in addition to these angles, we must allow very much more for the loss, unless we expand the tubes proportionately. These points are well worthy of consideration, as forming some of the most essential points on the subject of ventilation.

Dr. MACDONALD: I can illustrate the bad effect of angles by a very simple diagram. Suppose the tube is bent at an angle of 90°, the air, though compressible, would follow the ordinary laws of light and heat in its motion, thus passing down at the rate of 1,000 feet a minute. The deflection back again would be very con-

\* Assuming the available air to be represented by  $VA$ , when  $V$  is the velocity and  $A$  the sectional area, the coefficient of friction due to angles may be taken as  $\frac{1}{1 + \sin^2\theta}$ , so that the net available delivery of air will be:  $VA \cdot \frac{1}{1 + \sin^2\theta}$ , which will equal  $VA \times 1$  when  $\theta$  is 0°. At other angles it will be as follows:—

|                     |                                      |
|---------------------|--------------------------------------|
| $\theta = 15^\circ$ | $\frac{1}{1 + \sin^2\theta} = 0.937$ |
| $= 45^\circ$        | $\text{,,} = 0.667$                  |
| $= 70^\circ$        | $\text{,,} = 0.531$                  |
| $= 90^\circ$        | $\text{,,} = 0.500$                  |

So that a right angle reduces the amount to *one-half*.



siderable in that case (an angle of  $90^\circ$ ). A certain portion of air, however, would pass on. The angle of deflection is equal to the angle of incidence; that law would be carried out very perfectly, and the air in the tube would suffer a remarkable series of deflections thus. There must be a very great loss in this way—a loss which is calculated to be equivalent to one half—so that we should have only 500 feet passing out instead of 1,000.

Now, we will draw a diagram in which the tubes gradually increase in size from their origin. The course of the air is direct, in some instances, after the first deflection. There is, comparatively, little loss in the transit of air by this expansion, which permits of the delivery of the air without the enormous friction which must take place by the continued contraction of the tubes. I have now only to return you my thanks for the kind attention you have paid to me.

Mr. CHADWICK: I would commend to the attention of the naval hygienists a very good book, published by M. de Fonssagrives, the professor of Hygiène at Montpellier, and for a long time a Naval Surgeon. It certainly contains a great deal of fact, worthy of attention, on this, amongst other subjects. Amongst other things, I may mention one that as a statist I was very much interested in. He shows the degree of mortality amongst different classes of seamen—those down below and those higher up in the ship—that the degree of mortality ranges with the degree of vitiated air to which they are habitually exposed.

The CHAIRMAN: We must all admit that this subject is an exceedingly interesting one, and hitherto, I think, it has not received the attention which its importance demands. I say, as a sailor of experience and knowledge, there is no question that the system of ventilation in our ships has been of the rudest kind, not at all corresponding with the progress of science in the present day. I have listened, with great interest, to the observations which have been made by the lecturer, as well as to the very interesting statements of Mr. Chadwick and others. For my own part, I believe the true principle of ventilating ships, as well as buildings, is the principle of extraction, and you will really do very little good, unless you thoroughly and completely adopt the system of getting rid of the foul air, by artificial means, if you please, and leaving the supply of pure and fresh air to natural means, which will be easily accomplished. I think the meeting will join with me in expressing our thanks to Dr. Macdonald, for the very interesting lecture he has given us.



On the Elimination of Nitrogen by the Kidneys and Intestines during Rest and Exercise, on a Diet without Nitrogen. By E. A. PARKES, M.D., F.R.S.

The experiments recorded in this paper were undertaken to test the results arrived at by Professors Fick and Wislicenus, with respect to the elimination of nitrogen during exercise on a non-nitrogenous diet, as recorded in the Philosophical Magazine for June 1866 (Supplement).

Although these results are supported by the previous experiments of Dr. Speck, who has shown that if the ingress of nitrogen be restricted, bodily exercise causes no, or a very slight increase in the elimination of nitrogen by the urine, it appeared desirable to carefully repeat all the experiments, not only because the question is one of great importance, but because objections might be, and indeed have been, reasonably made to the experiments of Professors Fick and Wislicenus on the ground that no sufficient basis of comparison between periods of rest and exercise was given; that the periods were altogether too short, and that no attention was paid to the possible exit of nitrogen by the intestines.

In making the experiments, I was fortunate in being permitted to use the services of two perfectly healthy soldiers belonging to the Army Hospital Corps, and doing duty at the Royal Victoria Hospital at Netley. When soldiers are steady and trustworthy, as these men were, they are good subjects for experiments of the kind, as they are accustomed to very regular diet and occupation, and moreover, from their habits of obedience, carry out all instructions with great precision. The satisfactory results of my experiments, as shown by the almost perfect agreement in the effect on each man, is owing essentially to the very great care with which these two intelligent men carried out every rule which was laid down.

One of these men, S., is an admirable example of an average man; he is 22½ years old, 5 feet 8 inches in height, weighs close upon 150 lb., is strong, with large bones and firm muscles, with sufficient but not excessive fat; he is very temperate, and is no smoker. He has never been ill in his life. The second man, T., is also a perfectly healthy man, and has only been ill twice, once in China six years ago with tertian ague, and about three years ago with intermittent hemicrania. But he is in size and weight a good contrast to S. He is 36 years of age, very well proportioned and active, but is only 5 feet 4 inches in height, and weighs only



112 lbs. His size is not owing to any imperfection in make or nutrition, but to the fact that he comes of a small race, his father being small, and his mother remarkably so. He has small bones, good firm muscles, but very little fat. In fact, he is a thin man.

In the following experiments, the amounts of the total nitrogen of the urine (by soda-lime), of the urea, of the chloride of sodium, and on certain occasions of the phosphoric and sulphuric acids, were determined. The urea was determined by Liebig's solution, the chlorine being first eliminated, the phosphoric acid by acetate of uranium, the sulphuric acid by baryta and weighing.

The urine was collected from 8 A.M. to 8 A.M., and great care was taken not to lose any, and to pass it at the exact time.

The amount of water, solids, and nitrogen passed from the bowels were also determined on several occasions.

All the ingesta were most carefully weighed and measured, and the amount of water in the crumb and crust of bread and in the meat was determined. The nitrogen in the bread was also determined, but the long time demanded by the other processes prevented a complete analysis of the other food; this was, however, a matter of no importance as regarded the immediate object of the inquiry.

The experiments were commenced on December 6, 1866, and were continued daily till December 23.

*First Period of ordinary regulated Diet and Occupation.*

The men were first kept under observation for six days, in order to determine the variations in weight and in the excreta, and to see if the metamorphosis of tissue appeared to be healthy. This was found to be the case; in fact, more completely healthy urinary and intestinal excreta could not be conceived.

The weight of the body ranged nearly 1 lb. avoirdupois, or  $\frac{1}{2}$  kilog. above and below the mean amount in each man.

The daily average amount of food and drink was only slightly different in each man, and the quantity taken from day to day was very uniform.

The men were not placed on any absolute quantity, but ate according to appetite within narrow limits.

Average daily amount of food in ounces avoirdupois in this period:—

|  | S.    | T.    |
|--|-------|-------|
| Cooked meat .....  | 7.625 | 7.625 |
| Bread .....  | 16.66 | 16.26 |
| Vegetables:— $\frac{3}{4}$ potatoes, $\frac{1}{4}$ cabbage.....    | 13.87 | 13    |
| Butter .....   | 1     | 1     |
| Tea, including 3 oz. of milk, and $1\frac{1}{2}$ oz. sugar ....    | 20    | 20    |
| Coffee, including 3 oz. of milk, and $1\frac{1}{2}$ oz. sugar..... | 20    | 20    |
| Beer .....   | 15    | 15    |
| Water.....   | 5.8   | 2.33  |



S. took about .5 oz. salt and T. about .33, exclusive of salt in food. Adding the water of the so-called solid food to the water taken as drink, the daily amount of food was, in grms.—

|                                  |             |             |
|----------------------------------|-------------|-------------|
| Water-free solids, in grms. .... | S.<br>662.2 | T.<br>610.2 |
| Water, in grms. ....             | 2334.5      | 2212.3      |
| Total food ingesta .....         | 2996.7      | 2822.5      |

The mean weight of this period was for S. 67.7 kilogs. and for T. 50.6 kilogs. The ingress of solid food per kilog. of body-weight was 9.78 and 12 grms. respectively. The smaller man eat therefore absolutely rather less, but relatively more.

During four days of this period the mean daily urinary excretion was, in grms. and cubic centimetres—

|         | Quantity. | Sp. gr. | Urea.  | Nitrogen<br>in urea. | Total<br>nitrogen<br>by soda-<br>lime. | Non-<br>ureal<br>nitrogen. | Chloride<br>of<br>sodium. |
|---------|-----------|---------|--------|----------------------|--|----------------------------|---------------------------|
| S. .... | 1226      | 1028.25 | 35.001 | 16.334               | 17.973                                 | 1.639                      | 14.23                     |
| T. .... | 1335      | 1020.5  | 25.925 | 12.098               | 13.409                                 | 1.313                      | 11.685                    |

The excretion of nitrogen was fairly constant from day to day, the range of the urea being, in the case of S., from 38.37 to 33.36 grms., or between 2 and 3 grms., above and below the mean amount; and in the case of T. from 27.68 to 24.906, or nearly 1 gm. above and below the mean amount. This shows the daily equality of diet and exercise.

Calculated for body-weight, the amount per kilog. is—

|         | Urea. | Nitrogen<br>in urea. | Total<br>nitrogen. | Non-ureal<br>nitrogen. |
|---------|-------|----------------------|--------------------|------------------------|
| S. .... | .517  | .241                 | .265               | .024                   |
| T. .... | .512  | .239                 | .265               | .026                   |

The very close relation, indeed identity, as far as the total nitrogen is concerned, of the excretion per kilog. of body-weight in these two men comes out very clearly, and shows that there must be a real connexion between body-weight and urinary excretion.

It is remarkable that while the heavier man passed  $4\frac{1}{2}$  grms. more nitrogen daily from the kidneys than the smaller man, he did not eat any great excess of food. Unfortunately, as the nitrogen in the food was not perfectly determined, it is impossible to know precisely whether the 52 grms. of excess of solid food taken by the larger man would contain  $4\frac{1}{2}$  grms. more nitrogen. As, however, the amount of meat was precisely the



same, and as the smaller man only took  $\frac{1}{2}$  oz. or 14 grms. less bread, and 25 grms. less vegetables, this would seem to be unlikely, and, if so, some of the nitrogen taken by T. must have passed off in other ways.

The mean relation of the ureal to the total nitrogen was very close in each man, being, if the ureal nitrogen is taken as unity, as 1 to 1.1, and as 1 to 1.108 respectively. From day to day, however, the relation varied.

The intestinal excretion was examined only on one day, the last but one of the series.

Composition of Intestinal Excretion of Twenty-four Hours.

|         | Total weight, in grammes. | Solids. | Water. | Nitrogen in grammes. |
|---------|---------------------------|---------|--------|----------------------|
| S. .... | 171.1                     | 28.58   | 142.52 | 1.642                |
| T. .... | 198.47                    | 29.916  | 168.55 | 1.98                 |

The smaller man passed rather more solids, water, and more nitrogen than the larger man, and through this channel some of the nitrogen unaccounted for by the urine must have escaped. Whether this would account for the whole of it cannot be stated, as the experiments in respect of the nitrogen in the food and in the intestinal excreta of the whole period were not sufficiently exact to determine this point.

On the day when the intestinal excreta were analyzed, the total discharge of nitrogen by the kidneys and bowels was—

|              | S.     | T.     |
|--------------|--------|--------|
| Urine.....   | 20.155 | 13.410 |
| Bowels ..... | 1.642  | 1.980  |
| Total....    | 21.797 | 15.390 |

In S. nearly  $\frac{1}{3}$ th, and in T. nearly  $\frac{1}{5}$ th of the total nitrogen passed by the bowels.

On the day when the intestinal excreta were analyzed, the balance of ingesta and egesta, atmospheric oxygen being disregarded, was as follows:—

|   | S.    | T.     |
|---|-------|--------|
| Weight of body at commencement of }<br>period, in kilogrammes ..... | 67.6  | 50.76  |
| Weight of body at close .....                                       | 68.   | 50.89  |
| Gain or loss, in grammes.....                                       | + 400 | + 130  |
| Total ingesta by food and drink, in }<br>grammes .....              | 3083  | 2969   |
| Urinary egesta .....  | 1619  | 1774.8 |
| Intestinal egesta .....   | 171.1 | 198.47 |
| Skin and lung egesta .....  | 893   | 866    |

The tissue-changes in these two men are therefore very closely the same, and the men are quite comparable and well fitted for the experiments. T. has rather a larger excretion (chiefly of water) by the kidneys



and bowels, and rather less by the skin, but the difference is not great. He has also a larger excretion of nitrogen by the *bowels* than S.

*Second Period.—Non-nitrogenous Diet and Rest.*

On the day following the men were placed for two days on a non-nitrogenous diet consisting of arrowroot, sugar, and butter, from which the casein had been separated. The only nitrogenous substance taken was that contained in infusion of tea. I thought it better to allow the use of warm tea, without milk, both for the comfort of the men and because I was afraid of deranging the tissue-changes by too complete an alteration of diet.

The arrowroot was made into cakes with butter and sugar, and was also taken as jelly. Butter and sugar were taken as desired. I put no restriction on quantity, but left it to choice and appetite.

The following was the total diet of two days, December 10th to 11th, and 11th to 12th, in grammes :—

|                                     | S.     | T.    |
|-------------------------------------|--------|-------|
| Water-free arrowroot .....          | 480    | 382·7 |
| Water-free sugar .....              | 399·7  | 294·8 |
| Total dry carbohydrates .....       | 879·7  | 677·5 |
| Butter (without casein) .....       | 124·7  | 84·4  |
| Total water-free food in two days.. | 1004·4 | 761·9 |

Proportion of fat to carbohydrates 1 to 7, 1 to 8.

The dry starches and butter being assumed to be of their ordinary composition, the *daily* amount of carbon would be, in grammes,—

|                              | S.     | T.     |
|------------------------------|--------|--------|
| In arrowroot and sugar ..... | 195·33 | 150·4  |
| In butter .....              | 49·25  | 32·83  |
| Total .....                  | 244·58 | 183·23 |

|   | grms. | grms. |
|---|-------|-------|
| The amount of water taken in the two days.. | 4592  | 4592  |

It is of no consequence to calculate the proportion to body-weight, as some starch and sugar passed off by the bowels.

During these two days the men were kept in complete rest. They were allowed to get up for fear keeping in bed should make them feverish, but they sat quite still, or lay down on the bed, and did not leave the room during the time.

The *weight* decreased in the case of S. from 67·7 to 66·5 kilogrammes, and in the case of T. from 50·6 to 49·8 kilogrammes.

The *Urinary Excretion* was collected as usual on the first day, from 8 A.M. to 8 A.M.; but on the second day it was collected from 8 A.M. to 8 P.M., and again from 8 P.M. to 8 A.M., so that the last twelve hours' urine was secreted forty-eight to sixty hours after the last meal of nitrogenous food.



The full details are given further on, and I will now merely state the mean results.

On the mean of the two days the urea of twenty-four hours fell from 35 grammes to 16·765, or more than one-half in the case of S., and from 26 to 15, or rather less than one-half in the case of T.

The amount of urea in the last twelve hours was only 5 and 4·2 grammes for the two men. The total nitrogen, or a mean of the two days, fell from 17·97 and 13·4 to 8·176 and 7 grammes in the two men, while in the last twelve hours it was only 3·017 and 2·17 grammes, or at the rate of only 6·034 and 4·34 grammes in twenty-four hours.

Calculated according to body-weight, the results are per kilogramme :—

|         | Urea. | Nitrogen<br>in urea. | Total<br>nitrogen. | Non-ureal.<br>nitrogen. |
|---------|-------|----------------------|--------------------|-------------------------|
| S. .... | ·252  | ·118                 | ·136               | ·018                    |
| T. .... | ·301  | ·141                 | ·159               | ·018                    |

A more satisfactory comparison may perhaps be made by taking the last day only as representing more complete nitrogenous inanition.

Per kilogramme of body-weight.

|         | Urea. | Nitrogen<br>in urea. | Total<br>nitrogen. | Non-ureal<br>nitrogen. |
|---------|-------|----------------------|--------------------|------------------------|
| S. .... | ·2034 | ·0949                | ·1054              | ·0105                  |
| T. .... | ·2540 | ·1180                | ·1420              | ·0130                  |

Therefore during complete nitrogenous inanition the tissues of the smaller and older man furnished a slightly greater amount of nitrogen than those of the larger man, and this is evident both in the ureal and non-ureal nitrogen, so that it could scarcely be accidental.

The sulphuric acid and phosphoric acids were determined on the last day; the latter acid was in almost precisely the same absolute mean amount in each man, viz. ·9533 and ·941 gramme; the larger man passed, however, one-third more sulphuric acid, viz. ·633 as against ·427 gramme.

In the last twelve hours the chloride of sodium fell to 1 and ·42 gramme.

*The Intestinal Excretion.*

This was examined on the last day. The composition was—

|         | Total weight,<br>in grammes. | Solids. | Water. | Nitrogen. |
|---------|------------------------------|---------|--------|-----------|
| S. .... | 42·53                        | 6·6     | 35·93  | ·3875     |
| T. .... | 35·44                        | 6·55    | 28·89  | ·5360     |



The amount of solids was almost identical, but S. passed less nitrogen than T., as occurred also in the first period. The excreta were quite bilious, and had a greenish tint.

On the second day of nitrogenous inanition the balance of ingesta and egesta was as follows :—

|   | S.     | T.     |
|---|--------|--------|
| Weight of body at commencement of period,   |        |        |
| in kilogrammes .....                        | 66·89  | 50·1   |
| Weight of body at close of period .....     | 66·19  | 49·6   |
| Gain or loss, in grammes .....              | —680   | —500   |
| Total ingesta in food and drink, in grammes | 2995   | 2907   |
| Urinary egesta .....                        | 2477·5 | 2306   |
| Intestinal egesta .....                     | 45·53  | 35·44  |
| Skin and lung egesta .....                  | 1155   | 1065·5 |

The considerable derangement of the usual balance is very evident; it depended in part on the greater amount of water taken as compared with the former period, but not apparently altogether.

The water of the kidneys and the insensible perspiration were increased, while the intestinal water was lessened.

There was no sugar in the urine detectable by common tests.

The effects of the diet in the two men being thus very similar, a satisfactory basis of comparison was obtained for the period of exercise.

#### *Third Period.—Ordinary Food and Occupation.*

The men then returned to their former regulated diet and usual occupation for four days. Very nearly the same amount of food was taken as in the first period. At the end of four days the weight of the body in each man had returned almost exactly to its former amount.

The excretion of urea and the total nitrogen (which is given in more detail further on) followed a course very similar in each man.

On the first day after the return to nitrogenous diet the urea was in round numbers 14 and 12 grammes respectively below the mean of the first period, that is to say, it was nearly the same as during the first day of non-nitrogenous feeding; it then, in the case of S., increased day by day till it reached 29·67 grammes on the fourth day. In the case of T. it increased for two days, but fell a little on the fourth day; the total nitrogen, however, increased regularly every day.

The general result was that whereas in four days of the first period on a similar diet and exercise the excretion of nitrogen was 71·892 and 53·636 grammes respectively, during these four days of the third period the excretion of nitrogen in the urine was only 51·952 and 44·38 grammes; so that in the case of S. 19·94 and in the case of T. 9·256 grammes of nitrogen were retained in the body for the nutrition of the nitrogenous



tissues which had been brought into a state of nitrogenous inanition for two days by cutting off the supply of nitrogen.

At the end of the four days it was considered that the tissues had recovered their composition.

*Fourth Period.—Non-nitrogenous Diet and Exercise.*

*Diet.*—The diet during this period was of the same kind as in the second period. The men were directed to eat what they pleased of arrowroot made into cakes, and jelly, sugar, and the oil of butter.

They took in the two days of December 17–18, and 18–19, the following amounts:—

Non-nitrogenous Food in two days, in grammes.

|                                     | S.        | T.        |
|-------------------------------------|-----------|-----------|
| Water-free arrowroot .....          | 796·6     | 586·8     |
| Water-free sugar .....              | 421·5     | 360·0     |
| Total dry starches .....            | 1218·1    | 946·8     |
| Butter (without casein) .....       | 188·5     | 127·5     |
| Total water-free food.....          | 1306·6    | 1074·3    |
| Proportion of fat to starches ..... | 1 to 6·46 | 1 to 7·42 |

The daily proportion of carbon was—

|                   | S.      | T.      |
|-------------------|---------|---------|
| In starches ..... | 270·400 | 210·189 |
| In butter .....   | 74·478  | 50·395  |
| Total .....       | 344·878 | 260·584 |

The amount of water drank in the two days was. . 5159·5      4762·6.

Both men eat more during this period, partly because they felt more hungry, partly because the arrowroot-cakes were better made. T. especially took more butter, to which he felt a distaste previously.

The diet satisfied hunger; there was no sinking or craving for other kind of food, but it was monotonous, and neither man wished to continue it.

*Exercise.*—During these two days the men took the following amount of walking-exercise, on level ground. On the first day the exercise commenced at 9 A.M., and lasted till 7.45 P.M. with intervals. On the second day it commenced at 9 A.M., and lasted till 9 P.M. The men then went to bed.

*First day.*—23·76 miles=38·23 kilometres.

The work done was calculated according to Professor Haughton's for-



mula, that walking on a level surface is equal to lifting  $\frac{1}{20}$ th of the weight through the distance walked.

S., weight with clothes, 73.68 kilogrammes. Work done = 140839 kilogramme-metres, or 453.6 tons lifted a foot.

T., weight with clothes, 56.33 kilogrammes. Work done = 107655 kilogramme-metres, or 346.74 tons lifted a foot.

*Second day.*—Distance walked 32.78 miles = 52.74 kilometres.

Work done.

S. = 194294 kilogramme-metres.

= 625.8 tons lifted a foot.

T. = 147515 kilogramme-metres.

= 475 tons lifted a foot.

The first day's walking was done pretty well by both men. On the second day both men did the first 20 miles well, but felt very much fatigued during the last 13 miles. During the last 4 miles each man felt pain in the small of his back. Both men could, however, have marched on the following day if necessary.

With regard to the amount of fatigue as compared with other occasions, T. would give no opinion, as he said he had no fair basis of comparison. S., however, was clear that he was much more fatigued than on other food. In 1865 in Ireland he marched 26 miles on one day and 20 on the following, carrying his rifle, accoutrements, and forty rounds of ball-cartridge (an additional weight equal to 18 lb. nearly), and yet he did not feel fatigued at all; while on the present occasion, marching without weight except his clothes, he felt much exhausted.

Both men felt hungry; the food satisfied them; neither had any perceptible action of the skin; the days were fine and rather warm. During these two days S. lost almost precisely 2 kilogrammes in weight, and T. lost  $\frac{3}{4}$  of a kilogramme.

*The Urinary Excretion.*—The urine was collected as usual from 8 A.M. to 8 A.M. on the first day, and from 8 A.M. to 8 P.M., and from 8 P.M. to 8 A.M. on the second day. In order to compare this, I have placed together the chief urinary constituents in the two periods of rest and exercise.

Amount of Urine, in cubic centimetres.

|  | S.    |           | T.    |           |
|--|-------|-----------|-------|-----------|
|  | Rest. | Exercise. | Rest. | Exercise. |
| First 24 hours .....                                   | 2230  | 2550      | 2120  | 1650      |
| First 12 hours of second day }<br>(day urine) .....    | 1550  | 1210      | 1690  | 1000      |
| Second 12 hours of second }<br>day (night urine) ..... | 910   | 1020      | 600   | 650       |



## Excretion of Nitrogen, in grammes, in Urine.

|   | S.     |                |                                 |                | T.     |                |                                 |                |
|---|--------|----------------|---------------------------------|----------------|--------|----------------|---------------------------------|----------------|
|   | Urea.  |                | Total nitrogen<br>by soda-lime. |                | Urea.  |                | Total nitrogen<br>by soda-lime. |                |
|   | Rest.  | Exer-<br>cise. | Rest.                           | Exer-<br>cise. | Rest.  | Exer-<br>cise. | Rest.                           | Exer-<br>cise. |
| December 17-18, first<br>24 hours .....                         | 20.00  | 19.125         | 9.33                            | 10.048         | 17.3   | 16.005         | 8.765                           | 7.994          |
| December 18, first<br>12 (day) hours of<br>second day .....     | 8.525  | 7.865          | 4.005                           | 4.533          | 8.45   | 8.000          | 4.912                           | 4.522          |
| December 18-19, last<br>12 (night) hours of<br>second day ..... | 5.005  | 7.140          | 3.017                           | 3.360          | 4.2    | 5.200          | 2.170                           | 3.553          |
| Total in two days...  | 33.530 | 34.130         | 16.352                          | 17.942         | 30.030 | 29.205         | 15.847                          | 16.069         |

The excretion of the urea was very parallel in the two men, and followed this course. In each man in the first twenty-four hours nearly 1 gramme less was excreted by each man in the period of exercise as compared with that of rest; the larger man excreted nearly 3 grammes more urea than the smaller one.

In the next twelve hours each man excreted very nearly  $\frac{1}{2}$  a gramme less in the period of exercise as compared with rest. The absolute quantity was almost precisely the same in each man; in other words, the bulk of the larger man now had no effect in the urea.

In the last twelve hours (chiefly rest during night) the urea increased in each man in the period of exercise, as compared with that of rest, the absolute increase in S. being 2 grammes, and in T. 1 gramme.

Taking the whole period,—

|  |       |        |
|--|-------|--------|
| Excretion of urea in two days in the period<br>of exercise as compared with rest. .... | S.    | T.     |
|  | +0.60 | — .825 |

The results, when the total nitrogen is considered, are as follows:—

Slightly more nitrogen was excreted by S. in the period of exercise throughout; the excess being,—

|                             |       |
|-----------------------------|-------|
|                             | gram. |
| In the first 24 hours ..... | 0.718 |
| In the next 12 hours .....  | 0.528 |
| In the last 12 hours .....  | .343  |

Total excess of nitrogen during exercise period . 1.589

In the case of T. the total nitrogen during exercise was like the urea below the period of rest in the first 36 hours, but in the last 12 hours the excess of nitrogen in the period of exercise was so considerable as to cause the nitrogen of the two days of exercise to exceed that of rest by 0.223 gramme.



I draw the conclusion, therefore, that in both these men there was in the first 36 hours a decrease in the amount of urea; but in the last 12 or rest-hours of the 48 hours of the period of exercise, an increase.

That in the case of S. the total nitrogen was increased throughout the whole period of exercise, the total increase being 1·589 gramme, or 24·5 grains of nitrogen, while in the case of T. the total nitrogen, like the urea, was lower in the first 36 hours of the period of exercise, but increased greatly in the last 12 hours.

It may, indeed, be said that the difference between the amounts in the two periods is after all so inconsiderable as to be explained by the necessary errors of observation. But the constancy of the results in the two men, and in the case of T., the amount on the first day after the work-period, as given further on, seem to me to show the excess to be real.

On the same diet the heavier man excreted rather more urea and total nitrogen throughout than the smaller man, except in the first 12 hours of the second active day, when the urea was a trifle less.

The excretion of nitrogen in the urea, as compared with the total nitrogen, was (the ureal nitrogen being taken as unity) as follows:—

|                              | S.         | T.         |
|------------------------------|------------|------------|
| Period of rest . . . . .     | 1 to 1·042 | 1 to 1·13  |
| Period of exercise . . . . . | 1 to 1·126 | 1 to 1·178 |

In both cases there appears to have been a greater relative excretion of the nitrogenous substances other than ureal. Is it not probable that the creatinine was increased?

#### The Phosphoric Acid.

|                                    | S.    |           | T.    |           |
|------------------------------------|-------|-----------|-------|-----------|
|                                    | Rest. | Exercise. | Rest. | Exercise. |
| First period of 24 hours . . . . . | ..... | 1·873     | ..... | 1·144     |
| First 12 hours of second period .. | ·4930 | ·395      | ·5102 | ·5305     |
| Second 12 hours of second period   | ·4603 | ·749      | ·4308 | ·3978     |
| Total in last 24 hours . . . . .   | ·9533 | 1·144     | ·9410 | ·9283     |

On a non-nitrogenous diet the amount of phosphoric acid is not increased in a period of exercise as compared with a like period of rest. The immaterial increase in S. is counterbalanced by as slight a decrease in T.

#### The Sulphuric Acid.

|  | S.    |           | T.    |           |
|--|-------|-----------|-------|-----------|
|  | Rest. | Exercise. | Rest. | Exercise. |
| First 12 hours of second day (day) . . | ·372  | ·3791     | ·232  | ·1544     |
| Second 12 hours of second day (night)  | ·261  | ·3084     | ·195  | ·3011     |
| Total on second day . . . . .          | ·633  | ·6875     | ·427  | ·4555     |



The sulphuric acid was slightly increased in each man, but the increase was not great, and is perhaps within the limits of error.

#### Chloride of Sodium.

As no chloride of sodium was taken with the non-nitrogenous diet, the amounts excreted represent on the second day the mere waste of the tissues.

|   | S.    |           | T.    |           |
|---|-------|-----------|-------|-----------|
|   | Rest. | Exercise. | Rest. | Exercise. |
| First 24 hours .....                        | 6.914 | 3.280     | 4.9   | 1.866     |
| First 12 hours of second day (day time) ..  | 2.81  | .673      | 1.88  | 1.094     |
| Last 12 hours of second day (night time) .. | 1.01  | .119      | .42   | .150      |
| Total of last day .....                     | 3.82  | 0.892     | 2.30  | 1.244     |

As the results agree in both men, it appears that on a diet free from common salt much more chloride of sodium passes with the urine during rest than exercise; it is to be inferred that in the latter case chloride of sodium passes off by the skin.

No sugar was detected in the urine by the ordinary tests of liquor potassæ and Fehling's copper solution.

#### Intestinal Excretion.

This was examined on the last day, and was as follows:—

|        | Total weight,<br>in grammes. | Solids. | Water.  | Nitrogen. |
|--------|------------------------------|---------|---------|-----------|
| S. ... | 100.5                        | 5.63    | 94.87   | .5318     |
| T. ... | 120.7                        | 11.012  | 119.688 | .5739     |

If these numbers are compared with those of the corresponding period of rest, it appears that the total intestinal excretion was larger, but this arose in one man from an excess of water; in the other the solids were increased. In both men the nitrogen was in excess in the period of exercise, but the difference was not great, and may probably be disregarded.

#### Balance of Ingesta and Egesta.

\* On the second day of the non-nitrogenous diet and exercise, the balance of ingesta and egesta was as follows:—

|   | S.     | T.     |
|---|--------|--------|
| Weight of body at commencement of period, in kilogrammes .. | 66.66  | 50.1   |
| Weight of body at close of period .....                     | 65.73  | 49.87  |
| Gain or loss, in grammes .....                              | —930   | —230   |
| Total ingesta in food and drink, in grammes .....           | 3639   | 3124   |
| Urinary egesta .....  | 2247   | 1667   |
| Intestinal egesta .....                                     | 100.5  | 120.7  |
| Skin and lung egesta .....                                  | 2221.5 | 1556.3 |

If these numbers are compared with those given in the corresponding



period of rest, it will be seen that in both men the skin and lung egesta were very greatly increased (nearly 100 and 50 per cent. respectively); the intestinal egesta were also much larger; the urinary smaller, especially in the case of T., who passed nearly 800 cub. centims. less of urine, though he took more fluid as drink.

Neither of the men were conscious of any perspiration.

*Fifth Period.—Ordinary Diet and Exercise.*

The men were now again placed on their weighed diet, and took their ordinary exercise for four days, except that on the day following the walk of 33 miles they were tired and rested a good deal.

This period has now to be compared with the third period, which followed that of rest. As the amount of diet is very important, I give the mean amount in each of the four days of the third and fifth period, in English ounces.

| Daily amount, in ounces (437·5 grains).                                 | S.                           |                              | T.                           |                              |
|---|------------------------------|------------------------------|------------------------------|------------------------------|
|   | Third, or after rest-period. | Fifth, or after work-period. | Third, or after rest-period. | Fifth, or after work-period. |
| Cooked meat.....  | 8·5                          | 9·81                         | 6·625                        | 7·87                         |
| Bread.....  | 17                           | 16·18                        | 16·25                        | 16·75                        |
| Vegetables— $\frac{3}{4}$ potatoes, $\frac{1}{2}$ cabbage.....          | 13·68                        | 14·62                        | 13·5                         | 14·37                        |
| Butter .....  | 1                            | 1                            | 1                            | 1                            |
| Tea, with $1\frac{1}{2}$ oz. of milk, $1\frac{1}{2}$ oz. of sugar ..... | 20                           | 20                           | 20                           | 20                           |
| Coffee, with same amount of sugar and milk ..                           | 20                           | 20                           | 20                           | 20                           |
| Ale.....  | 21                           | 20                           | 18                           | 20                           |
| Salt uncertain .....  |                              |                              |                              |                              |

In the fifth period each man took rather more than an ounce more meat; S. took  $\frac{8}{10}$  oz. less bread, and T.  $\frac{1}{2}$  an ounce more; each man took  $\frac{3}{4}$  of an ounce more vegetables, and 1 and 2 ounces more water. It is to be regretted that the diet was not precisely the same; but the differences are not very great, and it was thought desirable to allow the men to satisfy their appetites. They were more hungry after the work-period than after the rest-period.

The *weight* increased in this period. In two days S. gained  $1\frac{1}{2}$  kilogramme and T.  $1\frac{1}{4}$  kilogramme, each man nearly getting his proper weight.

*The Urinary Excretion.*

The quantity of Urine.

|                     | S.                 |                    | T.                 |                    |
|---------------------|--------------------|--------------------|--------------------|--------------------|
|                     | After rest-period. | After work-period. | After rest-period. | After work-period. |
| Mean of 4 days..... | 1139               | 1028               | 1500               | 1495               |



There was scarcely any difference in T., and only 10 per cent. difference in S.

The Nitrogen.

|                  | S.                 |                              |                    |                              | T.                 |                              |                    |                              |
|------------------|--------------------|------------------------------|--------------------|------------------------------|--------------------|------------------------------|--------------------|------------------------------|
|                  | After rest-period. |                              | After work-period. |                              | After rest-period. |                              | After work-period. |                              |
|                  | Urea.              | Total nitrogen by soda-lime. | Urea.              | Total nitrogen by soda-lime. | Urea.              | Total nitrogen by soda-lime. | Urea.              | Total nitrogen by soda-lime. |
| First day .....  | 20·67              | 9·703                        | 20·8               | 10·237                       | 14·40              | 7·441                        | 23·00              | 11·58                        |
| Second day ..... | 25·68              | 12·304                       | 26·364             | 13·065                       | 23·00              | 11·480                       | 24·36              | 13·00                        |
| Third day .....  | 26·29              | 13·704                       | 28·32              | 14·590                       | 25·20              | 12·209                       | 24·57              |                              |
| Fourth day ..... | 29·67              | 14·260                       | 30·10              | 15·555                       | 22·99              | 13·231                       | 21·36              | 10·395                       |
| Mean .....       | 25·555             | 12·988                       | 26·396             | 13·361                       | 21·397             | 11·095                       | 23·322             | 11·658                       |
|                  |                    |                              |                    |                              |                    |                              |                    | Mean of 3 days.              |

Unfortunately, on the third day, in the case of T., the determination of the nitrogen by soda-lime was not satisfactory, and as some time elapsed before it could be again done, the amount has been omitted. But supposing there was the same relative excess over the ureal nitrogen as in the other days, the total nitrogen would have been 13·97 grms. Adopting this number, the following are the results :—

|   | S.    | T.    |
|---|-------|-------|
| Excess of urea in four days in after work-period.....           | 3·364 | 7·700 |
| Excess of total nitrogen in four days in after work-period..... | 1·492 | 4·560 |

The question now arises, was this excess of nitrogen excreted during the after work-period the result of the elimination of the products of destroyed muscle during the work-period, or was it the consequence of an excess of nitrogenous food in the four days following the exercise?

S. took 1·31 oz. avoirdupois more meat cooked and  $\frac{3}{4}$  oz. vegetables in the fifth than in the third period. The percentage of water in the meat was 57·49, and if the nitrogen be taken at 2·955 per cent., there would be in 1·31 oz. of cooked meat 1·1 gm. of nitrogen. In the vegetable there would be about 0·04 gm. of nitrogen. But from this amount must be deducted ·325 gm. of nitrogen not taken in the bread, making the total daily excess of nitrogen taken in the fifth period ·815 gm.; the daily excess of nitrogen in the urine was, however, only ·375 gm.; therefore, in the case of S., it cannot be affirmed that any excess of nitrogen was derived from disintegration of muscle during the exercise. In the case of T., the daily excess of nitrogen was larger, amounting daily to



1·14 grm., but as the man took 1·245 oz. more meat,  $\frac{1}{2}$  oz. more bread, and almost an ounce more vegetable (in all 1·2 grm. of nitrogen), it is evident that here also the excess of nitrogen in the urine might have been derived from the food. However, it is really probable that some of the very large excess of urea on the first day of this period, in the case of T., was really owing to augmented elimination from the work. No such excess is observable in the case of S., who had, however, a larger elimination than T. in the previous twelve hours.

#### The Chloride of Sodium.

The chloride of sodium rapidly returned to its previous amount.

|                  | S.    | T.    |
|------------------|-------|-------|
| First day .....  | 1·444 | 1·614 |
| Second day ..... | 6·169 | 4·905 |
| Third day .....  | 10·25 | 8·513 |
| Fourth day ..... | 8·117 | 6·446 |

It will be remembered that T. always took less salt than S. The third period is not comparable with the fifth, as the men took by mistake a great deal of salt on the second day.

#### The Phosphoric Acid.

|                  | S.    | T.    |
|------------------|-------|-------|
| First day .....  | 1·565 | 2·158 |
| Second day ..... | 2·413 | 2·273 |
| Third day .....  | 2·548 | 2·533 |
| Fourth day ..... | 2·408 | 2·065 |

As the phosphoric acid was not determined in the third period, no comparison is possible, but the above Table shows that no excess passed off in the after-period.

The sulphuric acid was not determined in this period.

#### The Intestinal Excreta, in grammes.

|                           | S.            |         |        |            | T.            |         |        |            |
|---------------------------|---------------|---------|--------|------------|---------------|---------|--------|------------|
|                           | Total weight. | Solids. | Water. | Nitro-gen. | Total weight. | Solids. | Water. | Nitro-gen. |
| Dec. 19-20; first day ... | 298           | .....   | .....  | .....      | 127·5         |         |        |            |
| Dec. 20-21; second day.   | 191·7         | .....   | .....  | .....      | 213           |         |        |            |
| Dec. 21-22; third day...  | 134·9         | 21·86   | 113·02 | 1·264      | 71            | 11·8    | 59·2   | ·7188      |
| Dec. 22-23; fourth day.   | 171·1         | .....   | .....  | .....      | 191·7         |         |        |            |

The large intestinal excretion on the first day, in the case of S., was owing to a little looseness of the bowels; there were two stools on that day, being the only instance of irregularity in either man. Otherwise, as



compared with the first period, there is no evidence in either case of any increased excretion; on the third day, indeed, the nitrogen was below that of the first period in each case.

The balance of ingesta and egesta was as follows on the third day of this period:—

|                                   | S.     | T.     |
|-----------------------------------|--------|--------|
| Weight of body at commencement... | 67.1   | 50.07  |
| Weight of body at close .....     | 67.08  | 50.08  |
| Gain or loss, in grammes .....    | -20    | +10    |
| Food and drink ingesta .....      | 2891.7 | 2877.5 |
| Urinary egesta .....              | 1808.7 | 1922.5 |
| Intestinal egesta .....           | 134.9  | 71     |
| Skin and lungs egesta .....       | 968.1  | 894    |

These numbers are fairly accordant with those of the first period, except that the intestinal excretion in T. was slightly less, and the urinary rather more.

The conclusions which can be drawn from the above experiments are not altogether accordant with those of Professors Fick and Wislicenus.

The decrease in the urea during the first thirty-six hours of the exercise-period, as compared with the rest-period, on a diet without nitrogen, which occurred in these two men, is, I think, conformable with the results obtained by the two experimenters mentioned; but this is not the case with the increase in the urea which I found in the last twelve hours. Yet that this increase is real is shown, I believe, by the accordant results in the two men, and by the increase of the total nitrogen of the exercise-period as determined by soda-lime.

The relative greater increase in my experiments of the non-ureal nitrogen (which makes me believe that an excess of nitrogenous compound other than urea, and possibly creatinine especially, was produced by the exercise) is not perceptible in their experiments, yet I cannot but believe that the fact was so, as it comes out with great clearness in the two men. The following Table shows this.

Relation of ureal to non-ureal nitrogen, the former being taken as unity.

|                          | S.         | T.            |
|--------------------------|------------|---------------|
| Before rest-period ..... | 1 to 1.1   | 1 to 1.108    |
| Rest-period .....        | 1 to 1.042 | 1 to 1.13     |
| After rest-period .....  | 1 to 1.009 | 1 to 1.116    |
| Work-period .....        | 1 to 1.126 | 1 to 1.178    |
| After work-period .....  | 1 to 1.08  | 1 to 1.06 (?) |
|                          |            | (three days). |

The reason which makes me believe the results are real, is the fact that the individual relation of the ureal and non-ureal nitrogen is preserved; that is to say, in T. the non-ureal nitrogen is, under normal circumstances, a little in excess as compared with S.; the same relative excess is also found in the work-period.



The reason of these differences between Professors Fick and Wislicenus and myself, is probably to be found in the short period of time during which their observations were carried on, and also because the urea was not determined by them in the night of the 30th to 31st of August.

But their conclusion is certainly borne out, that on a non-nitrogenous diet exercise produces no notable increase in the nitrogen of the urine, although, when the whole period is considered, it does produce a slight increase.

It may now also be said that, under similar conditions, exercise produces no increase in the excretion of nitrogen by the bowels.

The diminution in the amount of urea during the actual period of work, as compared with the rest-period, which, if I am not mistaken, is obvious in both our experiments, is a very curious circumstance. It shows, not that on a non-nitrogenous diet the nerves and muscles are totally unaffected by exercise, but that changes go on which either retain nitrogen in the body or eliminate it by another channel.

Is it possible that when the excess of nitrogen is restricted, the exhausted muscle will take nitrogen from the products given off from another portion of decomposing muscle, and thus the nitrogen may be used over and over again? or, after all, is nitrogen really given off in some form by the skin during exercise, as formerly supposed?

Although it is thus certain that very severe exercise can be performed on non-nitrogenous diet for a short time, it does not follow that nitrogen is unnecessary. The largest experience shows not only that nitrogen must be supplied if work is to be done, but that the amount must augment with the work. But for a short period the well-fed body possesses sufficient nitrogen to permit muscular exertion to go on for some time without fresh supply. But the destruction of nitrogenous tissues in these two men is shown by the way in which, when nitrogen was again supplied, a large amount was retained in the body to compensate for the previous deprivation.

I believe also that in these two men the great exhaustion of the second day showed that their muscles and nerves were becoming structurally impaired, and that if the experiments had been continued there would have been on the third day a large diminution in the amount of work.

I have found that the period when a restricted supply of nitrogen begins to tell on the work differs in different men; in one experiment I reduced the nitrogen in the food to one half its normal quantity in two men; in one no effect was produced on exercise in seven days, in the other a lessening of active bodily work was produced in five days; doubtless the previous nutrition of the muscle would influence the time.

Finally, it may be questioned whether the relation of elimination of nitrogen to exercise can be properly determined in this manner, *i. e.* by cutting off the supply of nitrogen. The true method would probably be to supply nitrogen in certain definite amount, so that the acting muscle might appropriate at once what it required.



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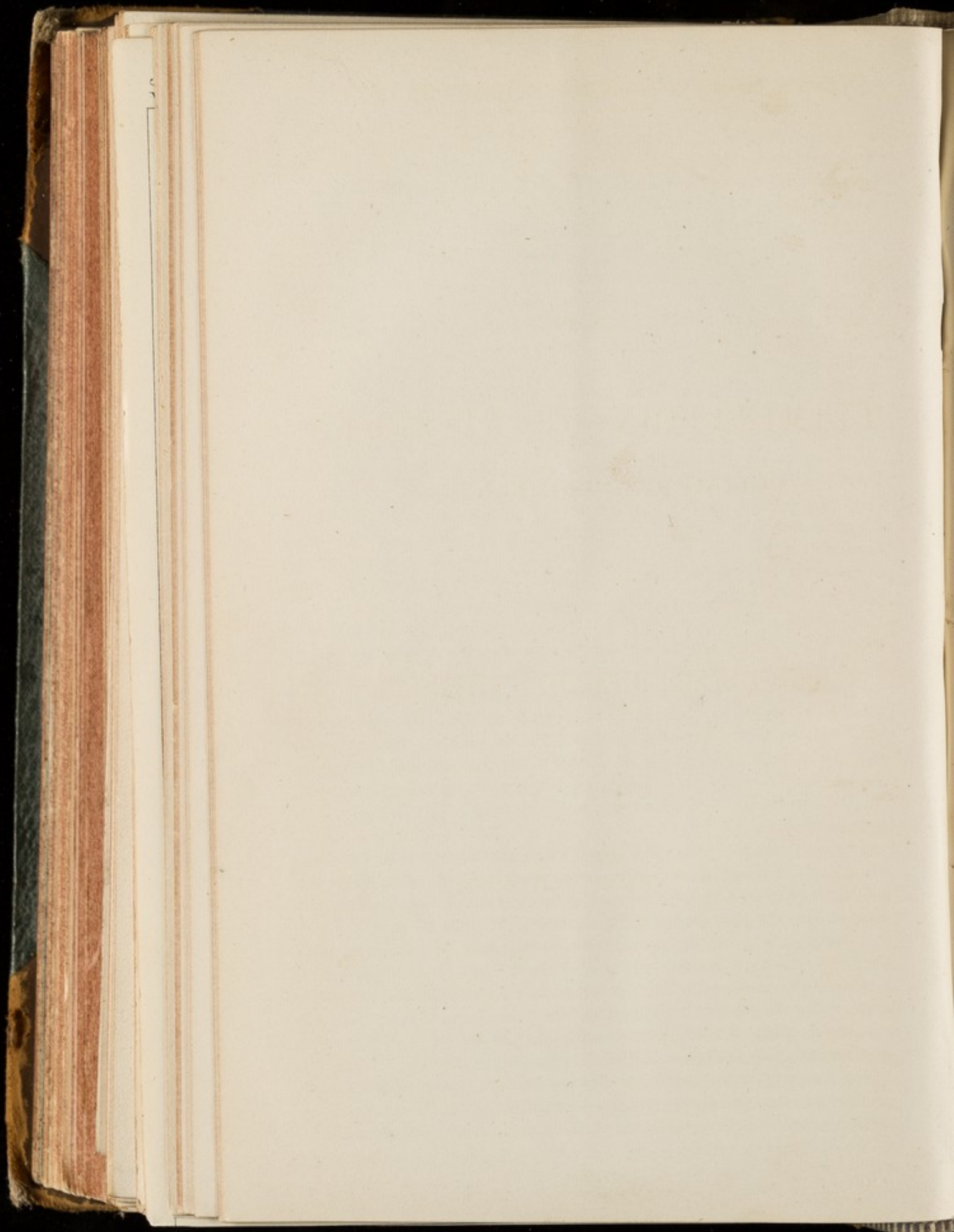
ELIMINATION OF NITROGEN

FROM THE BLOOD

BY J. H. HARRIS

NEW YORK, 1900







ON THE  
ELIMINATION OF NITROGEN  
DURING REST AND EXERCISE

ON A  
REGULATED DIET OF NITROGEN

BY  
E. A. PARKES, M.D., F.R.S.



On the Elimination of Nitrogen during Rest and Exercise on  
a regulated Diet of Nitrogen. By E. A. PARKES, M.D., F.R.S.

The experiments recorded in this paper are intended to complete the inquiry into the effect of rest and exercise on the elimination of nitrogen recorded in the Proceedings of the Royal Society (No. 89, 1867).

The experiments were made on two soldiers at the Royal Victoria Hospital at Netley. One of them (S.) was the subject of the former experiments, the other man (B.) was a fresh man. B. is a perfectly healthy temperate man, aged  $22\frac{1}{2}$  years, 5 feet  $9\frac{1}{4}$  inches in height, and weighing 140 lbs.

Extreme care was taken to ensure the greatest accuracy both as to food and as to the collection of the excreta. The whole value of such experiments as these, depends on the exactness with which all the conditions are carried out; and without perfect accuracy, the results would only mislead. I have every confidence that the conditions were faithfully observed; there is in fact evidence of this from the experiments themselves.

The course of the experiments was precisely the same as in the observations recorded in the last paper, except that the diet was during sixteen days exactly the same on each day. During four days the men were at their ordinary employment; during two days rested; returned to ordinary work for four days; took very active exercise for two days; and were then for four days more on ordinary occupation.

They took each day the same amount of food, viz.:—



| Articles.                | Amount, in ounces av. | Total nitrogen in each article, in grains*. |
|--------------------------|-----------------------|---|
| Bread .....              | 16                    | 60.99                                       |
| Meat (cooked) .....      | 9 (15 raw)            | 213   |
| Potatoes (cooked) .....  | 12                    | 12  |
| Cabbage (cooked) .....   | 3                     | .1  |
| Milk .....               | 6                     | 16.5  |
| Sugar .....              | 3                     |   |
| Butter.....              | 1                     | ?   |
| Salt.....                | .25                   |   |
| Infusion of tea .....    | 20                    | ?   |
| Infusion of coffee ..... | 20                    | ?   |
| Water.....               | 3 to 9                |   |
|                          |                       | 302.59<br>or 19.61 grammes.                 |

The bread was made always in the same way; the meat (steak) was of an uniform quality, and was carefully selected every day. The whole quantity of food was regularly eaten and at the same time. The only variation was that the potatoes weighed sometimes 12 or 12½, and sometimes 13 ounces (which, however, made very little change in the nitrogen), and that the amount of water drunk, usually 5 ounces at dinner and 2 at supper (on eleven days), was on five days taken in less quantity. No alcoholic liquid was taken, and there was no smoking.

This quantity of food was just sufficient to preserve the body at almost precisely the same weight; the men were in perfect health.

During the sixteen days 313.76 grammes (viz.  $19.61 \times 16$ ) of nitrogen were known to be taken by each man in the food. The following amounts were recovered from the urine in the same time.

S. .... 303.660 grammes, or 18.97 grammes daily.

B. .... 307.257 grammes, or 19.2 grammes daily.

The nitrogen in the stools (as presently noted) quite made up the difference (10 and 6 grammes) between these numbers and the amount of nitrogen passing in, indeed it rather exceeded it if the average of three days can be applied to sixteen. S. passed regularly rather more nitrogen by the bowels than B., and rather less by the urine.

The weight of the body at the beginning and end was nearly the same, and it is therefore certain that during the sixteen days no nitrogen escaped by the skin or lungs, but that all passed by the kidneys and bowels.

The urine was collected from 8 A.M. to 8 A.M., except on the second days of rest and exercise, when it was collected from 8 A.M. to 8 P.M., and from 8 P.M. to 8 A.M. The nitrogen was determined by soda-lime,

\* The nitrogen in the crust and crumb of bread and in the meat was determined once; the other amounts were calculated.



the urea by Liebig's mercuric nitrate, the chloride of sodium being got rid of. The stools were weighed every day\*.

On the days of rest the men remained in one room, sitting quite still or lying on the bed; they did not leave the room.

On the first day of exercise they walked twenty-four miles on level ground between 8.10 A.M. and 8 P.M. On the second day they walked thirty-five miles between 8.10 A.M. and 9.45 P.M.

The walking was done well, and S., who had been the subject of the previous experiments of exercise on a non-nitrogenous diet, was quite certain that he supported the fatigue much better under the meat diet, than on the former occasion when he was fed on starch and butter.

The amount of work done (the weight of their clothes being taken into account) was calculated by Mr. Haughton's formula, viz., that walking on a level surface is equal to lifting  $\frac{1}{20}$  of the weight through the distance walked.

|         | First day.         |                     | Second day.        |                     |
|---------|--------------------|---------------------|--------------------|---------------------|
|         | Kilogramme-metres. | Tons lifted a foot. | Kilogramme-metres. | Tons lifted a foot. |
| S. .... | 129198=            | 416                 | 194798=            | 627                 |
| B. .... | 125120=            | 403                 | 188605=            | 607                 |

*The weight of the body.*

The following Table gives the daily variations in the weight of the body during the whole period. The weight was taken at the end of the 24 hours.

|                                    | S.       | B.       |
|------------------------------------|----------|----------|
|                                    | lbs. av. | lbs. av. |
| Ordinary occupation, 1st day ..... | 145      | 139'5    |
| " " 2nd " .....                    | 145      | 140      |
| " " 3rd " .....                    | 146      | 139      |
| " " 4th " .....                    | 145      | 139'5    |
| Rest ..... 5th " .....             | 144      | 138'75   |
| " ..... 6th " .....                | 143'5    | 138'5    |
| Ordinary occupation, 7th " .....   | 144      | 138'5    |
| " " 8th " .....                    | 145      | 139'25   |
| " " 9th " .....                    | 145'5    | 139'5    |
| " " 10th " .....                   | 145      | 140      |
| Exercise ..... 11th " .....        | 142      | 137      |
| " ..... 12th " .....               | 139'5    | 135      |
| Ordinary occupation, 13th " .....  | 142      | 135'75   |
| " " 14th " .....                   | 143      | 137'5    |
| " " 15th " .....                   | 144      | 138'25   |
| " " 16th " .....                   | 144'5    | 139'75   |

The following Table shows the gain or loss of body-weight in grammes (round numbers).

\* I determined also the chloride of sodium and the phosphoric acid (on three occasions), but I have not included these results, in order not to complicate the statement.



|                                    | S.     | B.     |
|------------------------------------|--------|--------|
| Ordinary occupation, 1st day ..... | 0      | 0      |
| " " 2nd " .....                    | 0      | + 200  |
| " " 3rd " .....                    | + 400  | - 500  |
| " " 4th " .....                    | - 400  | + 300  |
| Rest ..... 5th " .....             | - 500  | - 400  |
| " ..... 6th " .....                | - 200  | - 100  |
| Ordinary occupation, 7th " .....   | + 200  | 0      |
| " " 8th " .....                    | + 500  | + 400  |
| " " 9th " .....                    | + 200  | + 100  |
| " " 10th " .....                   | - 200  | + 200  |
| Exercise ..... 11th " .....        | - 1500 | - 1400 |
| " ..... 12th " .....               | - 1000 | - 1000 |
| Ordinary occupation, 13th " .....  | + 1000 | + 500  |
| " " 14th " .....                   | + 600  | + 800  |
| " " 15th " .....                   | + 400  | + 400  |
| " " 16th " .....                   | + 300  | + 600  |

The weight in the first period was fairly constant; but during the rest-period one man lost  $1\frac{1}{2}$  lb. and one other 1 lb. in weight; the loss was gradual on the two days, which was different from the alternations which had gone before; the loss was subsequently recovered from at the rate of rather less than  $\frac{1}{2}$  lb. a day until the usual weight was regained on the third and fourth days. As the amount of food ingesta was not less, the loss must have been owing to increase in the egesta. This was certainly an unexpected result, but is yet quite certain.

The nature of the increase in the egesta will appear presently. I will merely state here that it was not owing to any condition of external temperature or atmospheric humidity acting on the skin or lungs. In the first four days of ordinary occupation the maximum temperature in the shade was  $59^{\circ}$ ,  $61^{\circ}2$ ,  $64^{\circ}8$ , and  $65^{\circ}$  F., while the mean of the maximum and minimum temperatures of twenty-four hours was  $51^{\circ}2$ ,  $52^{\circ}6$ ,  $50^{\circ}2$ ,  $54^{\circ}4$ . In the rest-period of two days the maximum shade temperature was  $64^{\circ}$  and  $68^{\circ}$ , and the mean temperature of the days was  $54^{\circ}5$  and  $58^{\circ}4$ . In the after-rest period, when the body was regaining weight on the same diet, the temperature rose greatly, the maximum being  $74^{\circ}8$ ,  $81^{\circ}6$ ,  $75^{\circ}$ , and  $70^{\circ}$ , while the mean of the maximum and minimum was  $61^{\circ}$ ,  $66^{\circ}3$ ,  $62^{\circ}$ , and  $59^{\circ}5$ .

It is evident therefore that the weight altered independently of the external temperature; for there was scarcely any difference between the first and rest-period, and if any action had been caused it should have gone on in the succeeding hotter days of ordinary exercise during the third period. The air was a little drier during the two days of rest ( $65.3$  per cent. of total humidity) than in the preceding and following periods ( $72.6$  and  $72.9$ ); but this slight difference had no effect, because on one of the days following the rest the air was both hotter and drier than on one of the rest-days, and yet the body gained weight.

During the period of exercise both men lost greatly and almost equally in weight, and then during the following period regained it, so that in four days one man had recovered his former weight, and the other man was only  $\frac{1}{2}$  lb. short.



### Excretion of Nitrogen by the Urine.

It will facilitate comparison to give the whole of the results in one Table.

Excretion of Urinary Nitrogen, in grammes. First Period.—Ordinary occupation.

| Date.         | S.                                       |        |                   |                     |                 |  | B.                                       |        |                   |                     |                 |  |
|---------------|--|--------|-------------------|---------------------|-----------------|--|--|--------|-------------------|---------------------|-----------------|--|
|               | Quantity of urine, in cubic centimetres. | Urea.  | Nitrogen in urea. | Non-ureal nitrogen. | Total nitrogen. | Proportion of ureal to non-ureal nitrogen. | Quantity of urine, in cubic centimetres. | Urea.  | Nitrogen in urea. | Non-ureal nitrogen. | Total nitrogen. | Proportion of ureal to non-ureal nitrogen. |
| May 1867.     |  |        |                   |                     |                 |  |  |        |                   |                     |                 |  |
| 1st day ..... | 1460                                     | 37·668 | 17·578            | ·308                | 17·886          |  | 1130                                     | 41·245 | 19·247            | 1·170               | 20·417          |  |
| 2nd " .....   | 1210                                     | 35·695 | 16·657            | ·153                | 16·810          |  | 810                                      | 34·587 | 16·140            | 1·378               | 17·518          |  |
| 3rd " .....   | 1210                                     | 36·300 | 16·940            | 2·272               | 19·212          |  | 810                                      | 34·425 | 16·065            | 1·025               | 17·090          |  |
| 4th " .....   | 1205                                     | 37·355 | 17·432            | ·088                | 17·520          |  | 870                                      | 38·280 | 17·864            | 1·119               | 18·983          |  |
| Mean .....    | 1271                                     | 36·754 | 17·1517           | ·7052               | 17·857          | 1 to '041                                  | 905                                      | 37·134 | 17·329            | 1·173               | 18·502          | 1 to '067                                  |

Second Period.—Rest.

|                  |      |        |        |       |        |      |      |        |       |        |           |
|------------------|------|--------|--------|-------|--------|------|------|--------|-------|--------|-----------|
| 5th day .....    | 1250 | 39.75  | 18.550 | 1.544 | 20.104 | 1400 | 40.6 | 18.946 | 1.175 | 20.121 |           |
| 6th "            | 604  | 19.932 | 9.302  | .553  | 9.855  | 800  | 22   | 10.266 | 1.012 | 11.278 |           |
| 8 a.m. to 8 p.m. |      |        |        |       |        |      |      |        |       |        |           |
| 6th day          | 540  | 17.01  | 7.938  | .377  | 8.315  | 520  | 15.6 | 7.280  | .264  | 7.544  |           |
| 8 p.m. to 8 a.m. |      |        |        |       |        |      |      |        |       |        |           |
| Mean of 2 days   | 1197 | 38.346 | 17.895 | 1.237 | 19.137 | 1360 | 39.1 | 18.246 | 1.225 | 19.471 | 1 to .067 |



## Third Period.—Ordinary occupation.

|              |      |        |        |       |        |           |     |        |        |       |        |           |
|--------------|------|--------|--------|-------|--------|-----------|-----|--------|--------|-------|--------|-----------|
| 7th day..... | 920  | 34.04  | 15.885 | .035  | 15.920 |           | 750 | 34.5   | 16.1   | .582  | 16.682 |           |
| 8th ".....   | 960  | 37.44  | 17.372 | .236  | 17.608 |           | 800 | 39.2   | 18.283 | .332  | 18.615 |           |
| 9th ".....   | 1180 | 38.94  | 18.172 | 1.210 | 19.382 |           | 920 | 41.4   | 19.32  | 1.262 | 20.582 |           |
| 10th ".....  | 960  | 34.08  | 15.914 | 1.626 | 17.54  |           | 910 | 35.035 | 16.349 | 1.712 | 18.061 |           |
| Mean .....   | 1005 | 36.125 | 16.836 | .7767 | 17.612 | 1 to .046 | 845 | 37.534 | 17.512 | .972  | 18.485 | 1 to .055 |

## Fourth Period.—Exercise.

|                  |      |        |        |       |        |           |        |        |        |       |        |           |
|------------------|------|--------|--------|-------|--------|-----------|--------|--------|--------|-------|--------|-----------|
| 11th day.....    | 1000 | 35.5   | 16.566 | 1.912 | 18.478 |           | 1110   | 39.96  | 18.648 | .342  | 18.99  |           |
| 12th ".....      | 430  | 15.05  | 7.023  | .324  | 7.357  |           | 565    | 19.492 | 9.096  | .957  | 10.053 |           |
| 8 a.m. to 8 p.m. | 650  | 26.741 | 12.479 | .978  | 13.457 |           | 540    | 21.600 | 10.080 | .795  | 10.875 |           |
| 12th day         |      |        |        |       |        |           |        |        |        |       |        |           |
| 8 p.m. to 8 a.m. |      |        |        |       |        |           |        |        |        |       |        |           |
| Mean of two days | 1040 | 38.645 | 18.034 | 1.607 | 19.646 | 1 to .089 | 1107.5 | 40.526 | 18.912 | 1.047 | 19.959 | 1 to .055 |

## Fifth Period.—Ordinary occupation.

|               |      |        |        |       |        |           |      |        |        |       |        |           |
|---------------|------|--------|--------|-------|--------|-----------|------|--------|--------|-------|--------|-----------|
| 13th day..... | 900  | 43.65  | 20.370 | .88   | 21.25  |           | 1000 | 38     | 17.734 | 2.517 | 20.25  |           |
| 14th ".....   | 1000 | 39.5   | 18.433 | 1.509 | 19.942 |           | 1100 | 40.15  | 18.736 | .537  | 19.273 |           |
| 15th ".....   | 1430 | 42.9   | 20.029 | 3.459 | 23.488 |           | 1250 | 35.625 | 16.625 | 2.623 | 19.248 |           |
| 16th ".....   | 1730 | 37.195 | 17.357 | 2.179 | 19.536 |           | 1610 | 41.86  | 19.534 | 2.063 | 21.597 |           |
| Mean .....    | 1265 | 40.811 | 19.047 | 2.006 | 21.054 | 1 to .105 | 1240 | 38.909 | 18.157 | 1.935 | 20.092 | 1 to .106 |



The elimination of nitrogen by the urine followed precisely the same course in each man ; and allowance being made for the difference in food, this course was identical with that determined in the former experiments, when the diet was non-nitrogenous. It is certain that neither during rest nor exercise did nitrogen pass off by the skin or lungs.

It will be convenient to consider the total nitrogen in the first instance.

During the first period of four days the total nitrogen excreted was 71.428 grammes by S. and 74.008 grammes by B. In the period of rest, instead of falling the nitrogen increased in amount, so that in two days 38.274 and 38.943 grammes were excreted. This is not only more than the half of the previous four days, but more than the amount of either the first two or the last two days of the first period. The greatest increase was in the first day of rest, but in the second day the amount was still above the mean of the previous period.

As afterwards shown, this was not owing to lessened elimination by the bowels ; for both the weight of the stools and the nitrogen increased in the period of rest. It seems impossible to avoid the conclusion that the condition of rest with an equal entry of nitrogen was accompanied by a daily increase of excretion by the urine of about 1 gramme more nitrogen.

It may, indeed, be said that this is within the limits of error or unavoidable variation, and may be accidental ; but if so, it seems most remarkable that the result should run in the same way and be of nearly the same amount in each case, and be confirmed by the independent observation of the urea. In the third period, when the men returned to their ordinary occupation, the nitrogen fell in both on the first day to a lower point than had ever before been noted, and then rose gradually, so that in the four days the amount was almost the same with that of the first period, 70.45 and 73.94 grammes being excreted. In the period of exercise which is to be compared with that of the rest, the results were identical with those of the former experiments when nitrogen was not supplied.

On the first day of exercise the nitrogen in each man fell below the corresponding day of rest by 1.626 and 1.131 gramme. In the next twelve hours, which were almost entirely occupied in exercise, the diminution was still greater, being 2.498 and 1.225 grammes, which would be equivalent to 5 and  $2\frac{1}{2}$  grammes for twenty-four hours. In the last twelve hours, of rest after work, the elimination increased greatly, so that 5.142 and 3.331 grammes more were excreted than in the corresponding rest-period ; the general result being that on the whole two days' period of exercise, as compared with the whole period of rest, there was an increase of about 1 gramme in the exercise-period in each man, owing entirely to the large excretion in the last twelve hours.



|   | S.       | B.       |
|---|----------|----------|
|   | grammes. | grammes. |
| Total nitrogen in urine in two days' rest ... | 38·274   | 38·943   |
| Total nitrogen in two days' exercise .....    | 39·292   | 39·918   |
|   | 1·018    | 0·975    |

The first day following the exercise was a day of almost complete rest; the nitrogen in both men was increased considerably over the average of the first and third periods, and very greatly indeed over the amount of the first day of the third period, the excess being 5·33 and 3·568 grammes over that day. This was the most considerable variation in the period of experiment. The nitrogen continued high all through this period, the result being that in the four days S. excreted 84·216 and B. 80·368 grammes, or 13 and 6 grammes respectively in excess over the first period of four days. It is clear indeed that during this period, the excretion of nitrogen must have been greater than the ingress.

I will not trace the changes in the urea in such detail. They were almost identical with those in the total nitrogen.

In the first period the amount of urea was almost precisely the same in the two men. In the rest-period it increased nearly 2 grammes daily in each man, fell during the third period to the former average, decreased greatly during the first thirty-six hours of the exercise-period as compared with the rest-period, and increased in the last twelve hours; in the last or after-work period it also increased, though in a less proportion than the total nitrogen.

The changes in the non-ureal nitrogen were also very similar in the two men, but will be best followed in the case of B., in whom the excretion of non-ureal nitrogen was more steady from day to day than in S. It was very slightly and immaterially increased in the rest-period, fell as slightly in the after rest-period, remained the same during the exercise-period, and increased to nearly double in the last four days. In S. it increased more in the rest-period and in the exercise-period than in B., and still more in the last four days. This increase in the non-ureal nitrogen after exercise is confirmatory of the results formerly obtained on this point.

If these results are looked at as a whole, it will be seen that though the changes in the amount of nitrogen were for the most part not great, still they were decided and evident changes, and occurred precisely in the same way in the two men. The coincidence in the changes in the urea and in the total nitrogen (determined by such different processes) is a strong argument that the results were real. Throughout the whole time the food was precisely the same, and the modifications were therefore not owing to variation in the ingress of nitrogen.

There was some variation in the amount of urinary water; but the



increased excretion of nitrogen was, I believe, not at all connected with it. Thus in the first and third periods the nitrogen was almost the same, yet in S. the difference in the mean amount of water was 266 cub. centims., and in B. was 60 cub. centims. In S., in the fifth period, the amount of water was the same (within 6 cub. centims.) as in the first period, yet the nitrogen was more than 3 grammes in excess. If individual days are taken, no obvious relation appears between the urinary water and the nitrogen. The largest amount of water in S. (1760 cub. centims.) corresponded to 19.536 nitrogen, while the largest amount of nitrogen (23.488) corresponded to 1430 cub. centims., and the next amount of nitrogen (21.25) was passed in only 900 cub. centims. of urine. In B. the largest amount of nitrogen (21.597) was contained in the largest amount of water (1610 cub. centims.), but almost as great an amount was contained in 1000 and 920 cub. centims. So that differences in the amount of water cannot explain the variations in the exit of nitrogen. If not owing to alteration in food, nor to variable passage of water through the kidneys, it seems tolerably certain that the conditions of rest and exercise were the causes of the variation.

*Excretion of Nitrogen by the bowels.*

The two men did not have quite the same amount of intestinal excreta. The average daily weight (sixteen days) in the case of S. was 4.798 ounces avoirdupois or 136 grammes; while in the case of B. they amounted only to 3.97 ounces, or 112.8 grammes.

The exact daily weights are given further on, and I will now merely state the amount of nitrogen, which was determined three times.

|                               | Nitrogen in grammes. |       |
|-------------------------------|----------------------|-------|
|                               | S.                   | B.    |
| Last day of first period..... | 1.227                | 0.644 |
| Last day of rest.....         | 1.486                | 1.091 |
| Last day of exercise .....    | 2.138                | 1.504 |
| Mean .....                    | 1.617                | 1.079 |

B. passed (if these three days represent the mean) 0.538 gramme less nitrogen daily by the bowels than S., and during the first twelve days he passed on an average 0.6 gramme more nitrogen in the urine, so that during these twelve days the discharge of nitrogen by the conjoint channels was within 1 gramme the same in the two men; the amounts being in S. 238.848, and in B. 239.757 grammes in twelve days, while the amount of nitrogen passing in (independent of a small amount in the tea, coffee, butter, &c.) was 235.32 grammes. This accordant result proves, I believe, both the estimate of the nitrogen in the food and the collection and analysis of the excreta to have been accurate. I was



quite unprepared for a result so close as that the difference in the excretion of nitrogen of the two men should be only 0.076 gramme, or scarcely more than 1 grain daily. In the last four days S. passed a little more nitrogen by the urine than B., thereby reversing what had gone before. The stools were not analyzed during this period, but I believe that the nitrogen must have been furnished by the body during these four days. As respects the effect of exercise on the intestinal nitrogen, there was a slight increase in rest over the previous period and in exercise over the rest-period.

If the following Table (p. 54) be analyzed, it will be found that the loss of weight in the rest-period was attributable in S. almost entirely to excess in the pulmonary and cutaneous excreta, while in B. it was owing to increase in the urinary and intestinal excreta. It might be presumed to have been chiefly water; but the simultaneous changes in the excretion of nitrogen give it interest. The channel of elimination in B. proves in another way that it was not owing to effect of external temperature in the air.

During the period of exertion the loss of weight was from increase in the skin and lung excretion, and it is interesting to observe how parallel it was in the two men; the loss of weight was subsequently made up by lessening of the skin and lung excreta. The intestinal excreta were not influenced either way by the exercise; and in spite of the great passage of water by the skin, the urinary water was not affected. The antagonism commonly stated to exist between the excretion of water by the skin and kidneys was not perceptible.

#### *Explanation of the preceding facts.*

Taking into account the experiments formerly recorded as well as those in this paper, we have to explain the following phenomena.

1. With an unchanged ingress of nitrogen there was a slight excess of nitrogenous excretion during rest as compared with a period of ordinary exercise.
2. There was a decrease of urinary nitrogenous excretion during active exercise as compared with a period of rest, and this was perceptible both when the ingress of nitrogen was stopped, as well as when nitrogen was supplied in regular amount.
3. There was an excess, not great, but long continued in nitrogenous excretion after exercise.
4. There was a retention of nitrogen in the system when it was again supplied after having been cut off, after both rest and exercise, and greatest in the latter case, showing that it is needed in the system, and that an insufficient supply at one time must be subsequently compensated.

In addition we cannot leave out of account the well-known dietetic fact, based on experience, that much muscular work always demands the supply of a larger amount of nitrogen.



TABLE showing the daily weights in grammes of the excreta.—The urinary and intestinal excreta were measured and weighed; the pulmonary and cutaneous excreta were determined by calculation, the ingesta, the changes in body-weight, and the weight of the urine and faeces, furnishing the elements of the calculation. The atmospheric oxygen was disregarded.

|                       | Food ingesta. | S. Egesta. |             |                          | Food ingesta. | B. Egesta. |             |                          |
|-----------------------|---------------|------------|-------------|--------------------------|---------------|------------|-------------|--------------------------|
|                       |               | Urinary.   | Intestinal. | Pulmonary and cutaneous. |               | Urinary.   | Intestinal. | Pulmonary and cutaneous. |
| Ordinary.             |               |            |             |                          |               |            |             |                          |
| During 1st day .....  | 2783          | 1510       | 106.5       | 1166.5                   | 2669          | 1180       | 106.5       | 1382.5                   |
| " 2nd " .....         | 2683.8        | 1256       | 220         | 1207.8                   | 2559          | 850        | 142         | 1367                     |
| " 3rd " .....         | 2648          | 1255       | 106.5       | 886                      | 2641          | 851        | 92.3        | 2197.7                   |
| " 4th " .....         | 2733          | 1251       | 99.4        | 1782.6                   | 2733          | 916        | 59.6        | 1457.4                   |
| Rest.                 |               |            |             |                          |               |            |             |                          |
| During 5th day .....  | 2698          | 1287       | 198         | 1589                     | 2690          | 1448       | 149.1       | 1493                     |
| " 6th " .....         | 2726          | 1185       | 106.5       | 1634.5                   | 2712          | 1346       | 142         | 1324                     |
| Ordinary.             |               |            |             |                          |               |            |             |                          |
| During 7th day .....  | 2740          | 960        | 99.4        | 1481                     | 2740          | 782        | 92.6        | 1465                     |
| " 8th " .....         | 2740          | 1005       | 227         | 1008                     | 2726          | 847        | 177.5       | 1601.5                   |
| " 9th " .....         | 2753          | 1228       | 179         | 1146                     | 2726          | 970        | 89.4        | 1466.6                   |
| " 10th " .....        | 2726          | 1001       | 116         | 1309                     | 2714          | 964        | 149.1       | 1501                     |
| Exercise.             |               |            |             |                          |               |            |             |                          |
| During 11th day ..... | 2754.8        | 1043       | 106.5       | 3105                     | 2804          | 1161       | 106.5       | 2937                     |
| " 12th " .....        | 2811.6        | 1079       | 144         | 2388.6                   | 2740          | 1155       | 95.1        | 2490                     |
| Ordinary.             |               |            |             |                          |               |            |             |                          |
| During 13th day ..... | 2726          | 947        | 99.4        | 679.6                    | 2726          | 1044       | 113.6       | 1068.4                   |
| " 14th " .....        | 2726          | 1048       | 134.9       | 943                      | 2733          | 1147       | 92.3        | 694                      |
| " 15th " .....        | 2733          | 1483       | 149.1       | 700.9                    | 2747          | 1293       | 78.1        | 976                      |
| " 16th " .....        | 2740          | 1766       | 85.2        | 67.7                     | 2726          | 1666       | 120.7       | 339                      |



Both the theories of muscular action now being discussed by physiologists seem to me insufficient to account satisfactorily for all the above facts.

The old theory was, that a muscle was more or less destroyed during action and was repaired during rest, and if so, it seemed reasonable to suppose that the action of the muscles would be measured by the amount of nitrogen eliminated. But the decrease in the nitrogenous excretion during exercise and its very moderate increase afterwards (an increase quite out of proportion to the amount of muscle supposed to be destroyed) seem quite inconsistent with this view.

The new theory, springing from the experiments of Professors Fick and Wislicenus, viz., that the nitrogenous framework of a muscle is merely the machinery which allows changes in the non-nitrogenous substances to take place, and that in itself it undergoes during exercise no change, though at first sight consistent with some of the facts, does not appear to be so with all. It does not account for the increase of nitrogenous excretion in rest, for the decrease during exertion, or for the increase afterwards, nor in a satisfactory manner for the great retention of nitrogen in the system which occurs after exercise on a non-nitrogenous diet.

There is something more in the facts than either disintegration *per se*, or stability of nitrogenous composition during muscular action, will account for.

We must find some other explanation; and it appears to me that we can only express the facts by saying that a muscle during action appropriates more nitrogen than it gives off, and during rest gives off more than it appropriates. We have, perhaps, strictly speaking, no right to go beyond this; but it seems clear that as a muscle could hardly be supposed to have two simultaneous actions, we may simplify the above expression by stating that during action a muscle takes nitrogen, and during rest gives it off. To put this in other words, the action of a muscle would seem from these experiments not to be connected with disintegration, but with formation; when it is in exercise the muscle increases, when it is quiescent it lessens in bulk. It may seem a bold innovation to attempt to reverse in this way the old theory of muscular action, especially as the same rule would have to be applied to nutrition generally; but if it explains all the facts, it is at any rate entitled to be fully considered.

In applying this expression in the explanation of the facts, I must premise that the nitrogen discharged by the kidneys and bowels cannot be supposed to be derived solely from the muscles. As it represents all the nitrogen going in, it must be derived from all the nitrogenous tissues, from the nervous substance, the gland cells, the albuminous membranes and fluids, in fact from all nitrogenous structures. That portion of it which is derived from the muscular system comes only in part from those



muscles whose state we can alter. We cannot alter the action of the muscles of respiration, of the heart, the stomach, and intestines, &c. We cannot even reduce the voluntary muscles to a state of complete and prolonged rest. There must be some movement, consequently we must not expect to find large variations in the elimination of nitrogen when a certain number of muscles only are kept in a state of comparative rest or exercise.

The food passing into the body after due preparation in the stomach, liver, and lungs, forms in the blood a reservoir or store of nutriment from which the different parts of the body take their supply as they require it, or according as the special stimulus of each enables it to appropriate it.

In these two men 19.6 grammes, or 302 grains passed daily into, and then out of, the store into the various nitrogenous tissues. This quantity exactly sufficed in the then state of activity of all the organs to preserve perfect action, and to keep the body-weight constant.

A certain number of muscles being brought into a state of rest, the nitrogenous elimination increased; in other words, the muscles appropriated nitrogen in less, and gave it off in greater, amount, owing, if my explanation be correct, to their more rapid disintegration during rest than exercise. This may be understood by supposing that if in the twenty-four hours the voluntary muscles are in a state of rest for twelve, and of exercise for twelve hours, and if the exercise is reduced to six hours, the removal going on at the same rate for eighteen hours instead of twelve hours will increase the exit of nitrogen 50 per cent. Accordingly during the period of rest the elimination of nitrogen increased, and this was necessarily most marked during the first day, when the bulk of the quiescent muscles was greater than on the second day, when it had been reduced by excess of elimination. I do not see how properly to explain the increase during rest except in this way; if the fact be as I state it, no theory of muscular action can be true which does not account for it.

The effect on the reserve or store of nitrogen in the blood would be to leave in it more nitrogen than usual at the end of the two days' rest. The men then commenced ordinary occupation, and immediately the muscles began again to contract and to assume more nitrogen in consequence of the increased exercise. As they had to regain their former composition, the elimination of nitrogen necessarily lessened, and the reserve must have fallen to its normal amount. They would use up the accumulation in the reserve as well as the fresh supply, and the equilibrium would be restored; this was nearly done in fact in twenty-four hours, as may be seen in the Table.

After four days the men took excess of exercise. The elimination of nitrogen at once lessened, because more was used by the contracting muscles, and there were lesser intervals of rest.



The last 10½ hours of the two exercise days formed a period of rest; and during this time the excretion increased, and this increase continued more or less for four subsequent days.

This might be explained by the passing off of excretory products formed during the contraction, according to the old theory; but if so, it seems singular that the increased excretion should have been so moderate, and at the same time should have been spread over so many days, whereas on the hypothesis I have suggested it is easily explicable.

During the exercise-period the extra action of the muscles had added a large amount of nitrogen to their structure; at the end of the time the muscles must have been bulkier, and therefore in the succeeding period of rest furnished a larger elimination of nitrogen than in the after rest-period when they were smaller. Moreover, after the exercise-period there was much more rest than after the rest-period. In the first day after the exercise the men were tired and rested the whole day, and even on the following days did not probably make so much exertion as usual. And the gradual elimination for so many days looks much more like a temporarily enlarged organ returning slowly to its normal size, than like the passage of accumulated excretory products; the chief product being the very soluble urea which is always so rapidly removed from the muscles that scarcely any can be detected in them.

The facts observed in the experiments on a non-nitrogenous diet seem now to be also easily explained. The decrease in the urea during the period of exercise equally occurred, because the muscles used more nitrogen in their action than in the rest-period, taking it from the store, and thereby no doubt robbing other parts.

During the two days of exercise without nitrogen, the muscles may have been just as well fed with nitrogen as during the experiments with 300 grains, only other parts could not have been so; other organs and the muscles not called into play must have acquired nitrogen with more difficulty, and consequently when nitrogen was again given, a large portion was retained to replenish the store and to feed the organs which had been on short allowance.

The quantity retained when nitrogen was again given did not serve (we may suppose) to nourish muscles exhausted by the exercise (which on my theory had even increased in nitrogenous constituents), but other parts.

If this reading of the facts be admitted, it may be asked how it will affect the inference drawn from the experiments of Professors Fick and Wislicenus. They determined the nitrogen discharged, calculated how much muscle it represented, and then argued (and as Dr. Frankland has shown, correctly argued) that this amount of muscle could not have produced the mechanical force which had been exerted. But it is apparent, if I am correct, that the measure of the work must be the amount of nitrogen appropriated by, and not that eliminated from, the muscle, and this was not shown in their celebrated experiments.

But though doubt may be raised as to the basis of their opinion, I



conceive the opinion itself was probably correct. Because even if the work is done during the period when nitrogen is added, and not when it is eliminated, it is difficult to suppose that the changes in the nitrogen are on a scale large enough to account for the result, or that the transformation of a particle of blood-albumen into a particle of muscle-albumen could be attended by any chemical changes which *per se* could equal the mechanical force produced. But we can imagine that such a transformation may be the cause of changes in the non-nitrogenous substances to which the manifestation of force is really owing. There is no reason why disintegration should be more attended with such changes than formation. Indeed it is perhaps more often that the union of chemical substances is attended by signs of transformation of force than their disunion. Or the stimulus which causes the addition of the nitrogen to the muscle may at the same moment originate the changes in the non-nitrogenous substances.

The fact that the substances the presence of which in the muscle suspends the contraction (and therefore, if I am right, the growth of muscle), appear from Ranke's latest observations to be derived from the non-nitrogenous substances, is another argument in favour of the view that great changes go on in these substances during muscular action.

If the opinion of Professors Fick and Wislicenus to this extent, and if the experiments of Ranke and others on the effect of the effete products be adopted, the following would be the theory of muscular action I would propose.

When a voluntary muscle is brought into action by the influence of the will, it appropriates nitrogen and grows; the stimulus or the act of union gives rise to changes in the non-nitrogenous substances surrounding the ultimate elements of the muscular substance which cause the conversion of heat into motion. The contraction continues (the will still acting) until the effete products of these changes arrest it; a state of rest ensues, during which time the effete products are removed, the muscle loses nitrogen, and can again be called into action by its stimulus.

This theory not only explains the experiments now recorded, but simplifies our ideas both of the growth and of the wasting of muscle, and seems likely to explain more easily some processes in disease.

It is also in greater accordance with the rules of diet derived from experience than the theory of Fick and Wislicenus. If correct, it shows why the muscle requires nitrogen for its action, and why increased action requires increased nitrogen. The food must either supply this, or the store of nitrogen in the blood and other organs must be lessened\*.

\* That an increased supply of fat, and perhaps of starches, is also desirable has long been practically recognized, though the store of fat already in the body renders this less necessary for a time. The observations of Lawes and Gilbert seem to me to render it possible that when a muscle parts with its nitrogen, fat is formed, and if so, a muscle disintegrating during rest may form a store of fat in its texture which may be further transformed at the next addition of nitrogen, *i.e.* at the next contraction.



It enables us to understand why in a well-fed body it may be some time after nitrogen is cut off before the muscles have any difficulty in obtaining what they want, and why in a body ill-supplied with nitrogen exertion lessens, or if kept up produces bad effects.

If exertion is persevered in under such circumstances, a failure somewhere is always observed. Frequently the nervous system or the heart shows signs of weakness, a result which could hardly be explained by the view of the Swiss Professors. It is certainly an argument for the view I have advocated, that it is in harmony with the teachings of experience, and restores to the rules of diet their old significance.



It is a common notion that the Russians are a wild and barbarous people, but this is a great mistake. They are a brave and valiant people, and their country is one of the most fertile in the world. They are also a very industrious people, and their manufactures are of great value. Their government is a despotism, but it is a despotism which has been able to maintain itself for many centuries.

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No. 24

EXPERIMENTS

ON

THE EFFECTS OF ALCOHOL  
(ETHYL ALCOHOL)

ON THE HUMAN BODY.

BY

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As a knowledge of the physiological effects of alcohol on the human body is a matter of great importance, and as previous observations leave some points in doubt, we took the opportunity which the willingness and zeal of a very intelligent healthy soldier afforded us of investigating this subject.

In order not to lengthen the paper, we have given only our own observations, without referring to those of others.

The plan of observation was as follows:—For twenty-six days the man remained on a diet precisely similar as to food and times of meals in every respect, except that for the first eight days he took only water (in the shape of coffee, tea, and simple water); for the next six days he added to this diet rectified spirit, in such proportion that he took, in divided quantities, on the first day one fluid ounce ( $=28.4$  cub. centims.) of absolute alcohol; on the second day two fluid ounces; on the third day four ounces, and on the fifth and sixth days eight ounces on each day. He then returned to water for six days, and then for three days took on each day half a bottle ( $=12$  ounces, or  $341$  c. c.) of fine brandy, containing 48 per cent. of alcohol. Then for three days more he returned to water.

There were thus five periods, viz. of water-drinking, alcohol, water, brandy, water.

Before commencing the experiments, the man, who had been accustomed to take one or two pints of beer daily, abstained altogether from any alcoholic liquid for ten days.

This man, F. B., is twenty-eight years of age, 5 feet 6 inches in height, and his usual weight is 134 or 136 lbs. He is finely formed, with little fat, and with largely developed powerful muscles; he has a clean smooth skin, a clear bright eye, good teeth, and is in all respects in perfect health. He is very intelligent, and assisted us so much that we are quite certain that there has not been a mistake even for a minute in the time of taking the temperatures and passing the urine. As he had always been accustomed to smoke, we thought it proper to allow him half an ounce of tobacco daily, for fear the deprivation of it might disturb his health.

In addition to the experiments recorded in this paper, we tested the accuracy of his vision, and the muscular power before and during the use of alcohol; but as we could not detect any difference, we do not give the experiments.

Our object being to test the dietetic effects of alcohol, we gave it in small and large quantities, but avoided producing any extreme symptoms of narcotism.



## FOOD.

Amount of solid food taken daily through the whole period:—

|                           | Ounces.<br>Avoirdupois. | Amount of nitrogen.<br>Grains. |
|---------------------------|-------------------------|--------------------------------|
| Bread .....               | 16                      | 60·99                          |
| Beefsteak .....           | 12                      | 173*                           |
| Fat for frying ditto .... | 2                       | ?                              |
| Butter .....              | 1                       | ?                              |
| Sugar .....               | 3                       |                                |
| Milk .....                | 6                       | 16·5                           |
| Potatoes .....            | 16                      | 16                             |
| Salt .....                | $\frac{1}{16}$          |                                |
|                           |                         | 266·49                         |
|                           |                         | or 17·27 grammes.              |

The meat was fried in the fat. The meals were taken always at the same time, viz. at 8 A.M., 1.30 P.M., and 5 P.M.; at 10 P.M. he took four ounces of water.

The amount of water taken was:—

| First period before alcohol. | In fluid ounces. | In c. c. |
|------------------------------|------------------|----------|
|                              | 48               | 1363     |
| Alcoholic period.            |                  |          |
| First day .....              | 47               | 1334     |
| Second day .....             | 46               | 1306     |
| Third day .....              | 44·5             | 1263·8   |
| Fourth day .....             | 42·7             | 1214     |
| Fifth day .....              | 41               | 1164     |
| Sixth day .....              | 41               | 1164     |
| After alcohol .....          | 48               | 1363     |
| Brandy period .....          | 42               | 1164     |
| After brandy .....           | 48               | 1363     |

It was not intended that the quantity of water should be altered; but through a misconception, the man thought the spirit and brandy were to take the place of the water, and took therefore less water in proportion. In one respect the mistake was fortunate. The total amount of water taken in the so-called solid food, and as drink, was about  $72\frac{1}{2}$  fluid ounces, or 2059 c. c. daily during the water days, and a little less during the days on which he took alcohol and brandy.

\* The nitrogen in the beefsteak was determined once; the result was almost identical with the results given in experiments in exercise recorded in No. 94 (1867) of the Proceedings of the Royal Society. As the bread was analyzed on a former occasion, it was not so now; its composition is very constant, the same amount of flour, water, and yeast being always used in the hospital bakery at Netley.



## WEIGHT OF BODY WITHOUT CLOTHES.

(Accuracy of Machine = turns with one ounce avoirdupois.)

Taken at 8 A.M., after the bladder was emptied, before breakfast and at the end of the twenty-four hours constituting the day.

| Days. | Water alone or alcohol and water,<br>taken as drink.                         | Weight in lbs. | Weight in<br>kilogrammes. |
|-------|--|----------------|---------------------------|
| 1     | Water.....   | 133.5          | 60.68                     |
| 2     | Water.....   | 133.75         | 60.795                    |
| 3     | Water.....   | 133.75         | 60.795                    |
| 4     | Water.....   | 134.5          | 61.1                      |
| 5     | Water.....   | 135.5          | 61.59                     |
| 6     | Water.....   | 135.8          | 61.72                     |
| 7     | Water.....   | 135.9          | 61.77                     |
| 8     | Water.....   | 136            | 61.81                     |
| 9     | One fluid ounce of absolute alcohol.....                                     | 136            | 61.81                     |
| 10    | Two fluid ounces .....   | 136            | 61.81                     |
| 11    | Four fluid ounces .....  | 135.75         | 61.7                      |
| 12    | Six fluid ounces.....  | 136            | 61.81                     |
| 13    | Eight fluid ounces .....   | 136            | 61.81                     |
| 14    | Eight fluid ounces.....  | 136            | 61.81                     |
| 15    | Water.....   | 136            | 61.81                     |
| 16    | Water.....   | 136            | 61.81                     |
| 17    | Water.....   | 135.5          | 61.59                     |
| 18    | Water.....   | 135.25         | 61.477                    |
| 19    | Water.....   | 135.5          | 61.59                     |
| 20    | Water.....   | 135.5          | 61.59                     |
| 21    | Brandy twelve fluid ounces (containing<br>six fluid ounces of alcohol) ..... | 135.5          | 61.59                     |
| 22    | " " .....  | 135.5          | 61.59                     |
| 23    | " " .....  | 136            | 61.81                     |
| 24    | Water.....   | 136            | 61.81                     |
| 25    | Water.....   | 136            | 61.81                     |
| 26    | Water.....   | 136            | 61.81                     |

During the first few days there was a gradual increase in weight, owing probably to the food being rather greater and the exercise less than before; equilibrium was reached on the eighth day, and the weight remained almost unchanged during the alcoholic period. There was slight decrease after alcohol; and on the last brandy day a slight increase, which was maintained in the after period. The general result appears to be that (other conditions remaining constant) the effect of alcohol in modifying weight is quite unimportant.

## THE TEMPERATURE OF THE AXILLA AND RECTUM.

The temperature of the axilla was taken (in Fahr. degrees) every two hours, from 8 A.M. to 10 P.M., the man being in bed and covered with the clothes. The temperature of the rectum was taken at 10 A.M., 2 P.M., and 10 P.M. The thermometer was in each case kept in for twenty minutes. We did not take the night temperatures for fear of injuring the health by destroying rest.



*Axilla Temperatures.*

The temperatures of the first day are omitted.

*First Period, before Alcohol.*

| Hours.       | Days.             |                  |                   |                  |                  |                    |                   |
|--------------|-------------------|------------------|-------------------|------------------|------------------|--------------------|-------------------|
|              | Second,<br>water. | Third,<br>water. | Fourth,<br>water. | Fifth,<br>water. | Sixth,<br>water. | Seventh,<br>water. | Eighth,<br>water. |
| 8 a.m. ....  | 97.1              | 98               | 97.2              | 98.6             | 97               | 98.5               | 98.4              |
| 10 " ....    | 97.7              | 97.2             | 98.1              | 98.7             | 98               | 98.5               | 99                |
| 12 noon .... | 97.8              | 97.9             | 97.9              | 98.2             | 98.1             | 99.1               | 98                |
| 2 p.m. ....  | 98.3              | 97.9             | 98.1              | 98.0             | 98               | 98.1               | 98                |
| 4 " ....     | 98.3              | 97.9             | 98.0              | 99.0             | 97.7             | 98.9               | 98.4              |
| 6 " ....     | 97.7              | 97.4             | 98.2              | 99.0             | 97.4             | 99                 | 99.4              |
| 8 " ....     | 98.3              | 97.4             | 98.0              | 98.2             | 97.8             | 99                 | 100.4             |
| 10 " ....    | 97.9              | 97.8             | 97.9              | 98.0             | 97.7             | 98                 | 100.4             |
| Means.....   | 97.9              | 97.7             | 97.9              | 98.46            | 97.7             | 98.69              | 99.1              |

*Second Period, with Alcohol.*

| Hours.      | Days.                           |                                 |                                    |                                   |                                      |                                      |
|-------------|---------------------------------|---------------------------------|------------------------------------|-----------------------------------|--------------------------------------|--------------------------------------|
|             | Ninth,<br>1 fl. oz.<br>alcohol. | Tenth,<br>2 fl. oz.<br>alcohol. | Eleventh,<br>4 fl. oz.<br>alcohol. | Twelfth,<br>6 fl. oz.<br>alcohol. | Thirteenth,<br>8 fl. oz.<br>alcohol. | Fourteenth,<br>8 fl. oz.<br>alcohol. |
| 8 a.m. .... | 97.8                            | 98.2                            | 98.4                               | 97.7                              | 98.6                                 | 98.4                                 |
| 10 " ....   | 98                              | 98                              | 98.4                               | 98.5                              | 100.3                                | 98.2                                 |
| 12 noon ... | 97.6                            | 98.6                            | 98.4                               | 99.4                              | 100.4                                | 98.4                                 |
| 2 p.m. .... | 98.4                            | 97.8                            | 100.1                              | 98                                | 99                                   | 97.8                                 |
| 4 " ....    | 97.6                            | 99.5                            | 98.5                               | 98.4                              | 98.9                                 | 97.6                                 |
| 6 " ....    | 98.2                            | 98.2                            | 99                                 | 100                               | 98.6                                 | 98.4                                 |
| 8 " ....    | 98.4                            | 99.6                            | 98.6                               | 99.2                              | 99.2                                 | 98.4                                 |
| 10 " ....   | 98                              | 97.8                            | 98                                 | 98.8                              | 97.6                                 | 97.8                                 |
| Means ..... | 98                              | 98.46                           | 98.7                               | 98.6                              | 99.08                                | 98.1                                 |

*Third Period, after Alcohol.*

| Hours.      | Days.                |                      |                        |                       |                       |                      |
|-------------|----------------------|----------------------|------------------------|-----------------------|-----------------------|----------------------|
|             | Fifteenth,<br>water. | Sixteenth,<br>water. | Seventeenth,<br>water. | Eighteenth,<br>water. | Nineteenth,<br>water. | Twentieth,<br>water. |
| 8 a.m. .... | 98.2                 | 98.1                 | 98.2                   | 98.2                  | 98.2                  | 98                   |
| 10 " ....   | 99                   | 98.8                 | 97.6                   | 98                    | 97.8                  | 98.4                 |
| 12 noon ... | 98.2                 | 98.8                 | 98.4                   | 97.4                  | 98.5                  | 98                   |
| 2 p.m. .... | 97.8                 | 98.2                 | 98.4                   | 98.4                  | 98.6                  | 98                   |
| 4 " ....    | 97.6                 | 98.2                 | 98.0                   | 98.6                  | 98                    | 98                   |
| 6 " ....    | 98.4                 | 99                   | 98.4                   | 97                    | 98.4                  | 98.6                 |
| 8 " ....    | 98.4                 | 100.7                | 98.0                   | 99.4                  | 97.8                  | 98.2                 |
| 10 " ....   | 97.8                 | 97.6                 | 98.6                   | 98                    | 98                    | 98                   |
| Means ..... | 98.17                | 98.8                 | 98.2                   | 98.12                 | 98.16                 | 98.15                |



*Fourth and Fifth Period. Brandy and after Brandy.*

| Hours.      | Days.                       |                             |                             |              |              |              |
|-------------|-----------------------------|-----------------------------|-----------------------------|--------------|--------------|--------------|
|             | 21st, 12 fl.<br>oz. brandy. | 22nd, 12 fl.<br>oz. brandy. | 23rd, 12 fl.<br>oz. Brandy. | 24th, water. | 25th, water. | 26th, water. |
| 8 a.m. .... | 98.2                        | 98.6                        | 97.8                        | 98.2         | 98           | 98.2         |
| 10 „ ....   | 98.4                        | 98.8                        | 98.4                        | 98.5         | 98.4         | 98.4         |
| 12 noon ... | 98.4                        | 99.4                        | 98.2                        | 98           | 98.2         | 98.2         |
| 2 p.m. .... | 98.9                        | 97.4                        | 98.0                        | 98.4         | 99           | 99           |
| 4 „ ....    | 99                          | 98.8                        | 98.0                        | 98.4         | 97.8         | 98.7         |
| 6 „ ....    | 99.6                        | 99                          | 98.8                        | 98.8         | 98.2         | 98           |
| 8 „ ....    | 99.4                        | 98.4                        | 98.8                        | 98.2         | 98           | 97.8         |
| 10 „ ....   | 99.2                        | 97.8                        | 98.2                        | 98           | 97.8         | 98.7         |
| Means ..... | 98.8                        | 98.5                        | 98.25                       | 98.3         | 98.17        | 98.35        |

If the means of the days of the 5 periods be put together, and the means for each period be taken, the results are—

|                      | Mean temperature. |
|----------------------|-------------------|
| Before alcohol ..... | 98.207            |
| During alcohol ..... | 98.49             |
| After alcohol .....  | 98.266            |
| During brandy .....  | 98.51             |
| After brandy .....   | 98.27             |

These experiments show that alcohol and brandy produce little change in the temperature of the axilla in healthy men; but what effect there is appears to be rather in the direction of increase than of diminution. But that the effect of 8 ounces (=227 c. c.) of absolute alcohol, taken in 24 hours, is really trifling is seen by the Table; on the 13th day, when this large quantity was taken, the temperature rose higher than on any other day; the thermometer was over 100° at 10 and 12 o'clock, and the mean of the 8 observations was 99°; it might have been thought that alcohol really increased the temperature, but on the next day, with the same amount of alcohol, the temperature was lower throughout, and the mean of the day was only 98°·1. On the 12th and 13th days in fact the man had a slight febrile catarrh, as will be noticed further on, and the temperature rose during this attack.

We draw the conclusion that the changes in temperature in the axilla were insignificant.



*Temperature of the Rectum.*

| Days. | Fluid taken.                 | Hours. |        |        |        |         |
|-------|------------------------------|--------|--------|--------|--------|---------|
|       |                              | 8 a.m. | 2 p.m. | 4 p.m. | 6 p.m. | 10 p.m. |
| 1     | Water.....                   | .....  | .....  | .....  | .....  | .....   |
| 2     | Water.....                   | .....  | 98.9   | .....  | .....  | 97.9    |
| 3     | Water.....                   | 98.2   | 99     | .....  | .....  | 98.1    |
| 4     | Water.....                   | 98.1   | 99.2   | .....  | .....  | 98.9    |
| 5     | Water.....                   | 98.6   | 99.1   | .....  | .....  | 98.1    |
| 6     | Water.....                   | 98.1   | 99     | .....  | .....  | 99.1    |
| 7     | Water.....                   | 99.2   | 98.9   | .....  | .....  | 99      |
| 8     | Water.....                   | 99     | 100.4  | .....  | .....  | 101     |
| 9     | Alcohol, 1 fluid ounce ..... | 99.4   | 101    | .....  | 99.4   | 98.2    |
| 10    | Alcohol, 2 fluid ounces..... | 98.4   | 99.6   | .....  | 100    | 99.6    |
| 11    | Alcohol, 4 fluid ounces..... | 98.6   | 99.5   | .....  | 99.6   | 99.6    |
| 12    | Alcohol, 6 fluid ounces..... | 97.6   | 99.7   | 99.9   | 99.7   | 100.2   |
| 13    | Alcohol, 8 fluid ounces..... | 100.2  | 100.4  | 100.5  | 99.2   | 98.2    |
| 14    | Alcohol, 8 fluid ounces..... | 99.6   | 99.6   | .....  | .....  | 98.4    |
| 15    | Water.....                   | 99     | 98.8   | .....  | .....  | 98.8    |
| 16    | Water.....                   | 98.8   | 99.4   | .....  | .....  | 98.2    |
| 17    | Water.....                   | 98.6   | 99.4   | .....  | .....  | 98      |
| 18    | Water.....                   | 98.4   | 99.5   | .....  | .....  | 98.4    |
| 19    | Water.....                   | 99     | 98.4   | .....  | .....  | 98.6    |
| 20    | Water.....                   | 99     | 99.6   | .....  | .....  | 99.5    |
| 21    | Brandy, 12 fluid ounces ...  | 99.6   | 99     | .....  | .....  | 99.8    |
| 22    | Brandy, 12 fluid ounces ...  | 100    | 99.4   | .....  | .....  | 99.1    |
| 23    | Brandy, 12 fluid ounces ...  | 98.6   | 99.6   | .....  | .....  | 99      |
| 24    | Water.....                   | 99     | 99.8   | .....  | .....  | 98.8    |
| 25    | Water.....                   | 98.8   | 99.6   | .....  | .....  | 98.6    |
| 26    | Water.....                   | 99.2   | 99.6   | .....  | .....  | 99.5    |

The mean results are as follows:—

| Hours.                         | Rectum mean temperature. |                            |                         |                           |                         |
|--------------------------------|--------------------------|----------------------------|-------------------------|---------------------------|-------------------------|
|                                | First period.<br>Water.  | Second period.<br>Alcohol. | Third period.<br>Water. | Fourth period.<br>Brandy. | Fifth period.<br>Water. |
| 8 a.m. ....                    | 98.5                     | 98.96                      | 98.8                    | 99.4                      | 99                      |
| 2 p.m. ....                    | 99.21                    | 99.96                      | 99.18                   | 99.3                      | 99.66                   |
| 10 p.m. ....                   | 98.87                    | 99.03                      | 98.6                    | 99.3                      | 98.96                   |
| Mean of the three observations | 98.86                    | 99.31                      | 98.86                   | 99.33                     | 99.21                   |

The rectal observations show that alcohol and brandy in the above quantities cause no lessening of temperature in the rectum; on the contrary, there is slight increase in both the second and fourth periods as compared with the first and third (which were precisely the same), though, as in the case of the axilla, the difference is not great, being in each case very nearly half a degree Fahr.

In this man the rectum temperature is slightly greater than the axillary. As no great number of observations have been made on this point,



the following notes of a single day (the eighteenth, when the man was taking water) may be interesting:—

| Hour.        | Axilla<br>temperature. | Rectum<br>temperature. |
|--------------|------------------------|------------------------|
| 8 a.m. ....  | 98·2                   | 98·4                   |
| 10 „ ....    | 98                     |                        |
| 11 „ ....    | 98                     | 98·6                   |
| 12 noon .... | 97·4                   | 98·2                   |
| 1 „ ....     | 97·6                   | 98·4                   |
| 2 „ ....     | 98·4                   | 99·5                   |
| 3 „ ....     | 98·2                   | 99·4                   |
| 4 „ ....     | 98·6                   | 99·2                   |
| 5 „ ....     | 97·4                   | 98·6                   |
| 6 „ ....     | 97                     | 98                     |
| 7 „ ....     |                        | 97·6                   |
| 8 „ ....     | 99·4                   | 98·2                   |
| 9 „ ....     | 97·6                   | 98·2                   |
| 10 „ ....    | 98                     | 98·4                   |
| Mean....     | 97·98                  | 98·51                  |

The mean difference on this day in favour of the rectum is  $0^{\circ}53$ ; but, as appears from the former Tables, the rectum sometimes has a temperature of  $1^{\circ}$ , or even  $2^{\circ}$ , more than the axilla: but such difference as the last number seldom occurred.

The general result from all these observations surprised us, considering the numerous experiments on men and animals in which the temperature has been found to be lowered by alcohol. An explanation may, however, be possible. Our experiments being to ascertain the dietetic properties of alcohol, we never aimed at producing very decided narcotism or marked symptoms of poisoning; and as we had to deal with a perfectly healthy resisting organism, which received always the same quantity of food, the effect of alcohol in lowering temperature might not be so well marked as in an ill-fed or unhealthy body. We do not dispute the accuracy of the observations which show that large and narcotic doses of alcohol lower the temperature of the body in men and animals; but our experiments prove that alcohol, in the limits we have stated and with an equal supply of food, did not have this effect in a perfectly healthy man.

The rising of mean temperature which seemed to occur was not considerable enough to make it probable that it was due to heat derived from combustion of alcohol; it was more probably owing to quickened circulation, and in addition the slight febrile attack which occurred on the twelfth and thirteenth days, augmented the mean temperature of the alcoholic period; but this would not account for the similar slight increase in the brandy period.



## THE EFFECT ON THE CIRCULATION.

The pulse (taken usually every two hours) was decidedly more frequent when alcohol and brandy were used. The mean of all the observations in the recumbent position was 73·57 beats per minute in the first period when water was taken; during the alcoholic days the mean number of beats was 88·5; after alcohol 78·6; during the brandy days 91·4, and after brandy 81·1.

If particular hours are taken the same results come out, as shown in the following Table:—

|                | Mean pulse<br>at 10 a.m. | Mean pulse<br>at 2 p.m. | Mean pulse<br>at 10 p.m. |
|----------------|--------------------------|-------------------------|--------------------------|
| Before alcohol | 75·5                     | 80·8                    | 73                       |
| During „       | 99                       | 94                      | 80·8                     |
| After „        | 89·66                    | 87·5                    | 71·6                     |
| During brandy  | 96·6                     | 93                      | 92                       |
| After „        | 88·6                     | 84                      | 73                       |

There is therefore no doubt that the frequency of the pulse was increased, and the effect was also persistent; for, though it fell after the alcohol was left off, it had not reached in six days the point which was proper to it before the alcohol.

The pulse was not only increased in rapidity, but it was fuller; it appeared to have more volume.

The highest mean pulse on any day before alcohol was 77·5 beats; the mean pulse of the first alcoholic day (one fluid ounce of absolute alcohol) was 80; with two ounces of alcohol 78·3; with four ounces 86; with six ounces 98·3 (but there was exceptional fever); with eight ounces 93·6; and on the last day, with eight ounces, 94·7. On the first day after alcohol it sank to 80.

The effect on the circulation in the small vessels of the skin was very marked. The face, ears, and neck were flushed, and on the days of the large doses the face was slightly swollen. The skin of the trunk, as well as of the face, appeared hot to the man himself, and this was no doubt dependent on the same cause. It was some time before the turgescence of the small cutaneous vessels lessened. Accompanying it was a sense of fulness and heaviness in the head, as if the intracranial vessels were also enlarged, and there was a feeling of warmth at the epigastrium.

Sphygmographic observations were made on the right radial artery. They were always taken with the same instrument, with an equal pressure, and when the man was in a recumbent position. Altogether more than 150 tracings were taken, but some were spoilt in photographing\*. All the remainder are subjoined.

One fluid ounce of absolute alcohol in twenty-four hours altered the

\* They were taken and photographed with great care by Mr. James Sylvester, Apothecary to the Forces, who also gave us much assistance in various ways.



tracings, as will be seen on comparing the 10 p.m. curves of the first period with that of the ninth day. The larger quantities of alcohol produced, however, greater effects, and the tracings of the twelfth, thirteenth, and fourteenth days are very striking. They show, of course, a greatly increased rapidity of beat. The first event (to use Dr. Burdon-Sanderson's terms), or systolic wave, is better marked; the ascent of the lever is more vertical, and is greater in amount; the summit is sometimes sharp, but in most cases rounded. The second event, or arterial pressure, is not apparently so much altered, and in most cases probably is not changed. The third event, or diastolic collapse, is more rapid than before alcohol; there is very little evidence of the fourth event, or diastolic expansion.

The interpretation is that there is increased frequency of the ventricular contractions, and increased rapidity of each contraction; the ventricle therefore is doing more work in a given time, the period of rest for the heart is much shortened, the blood moves more freely than usual through the capillaries, so that the increased quantity of blood which it is to be presumed is thrown into the arteries, is very quickly got rid of.

#### SPHYGMOGRAPHIC TRACINGS.

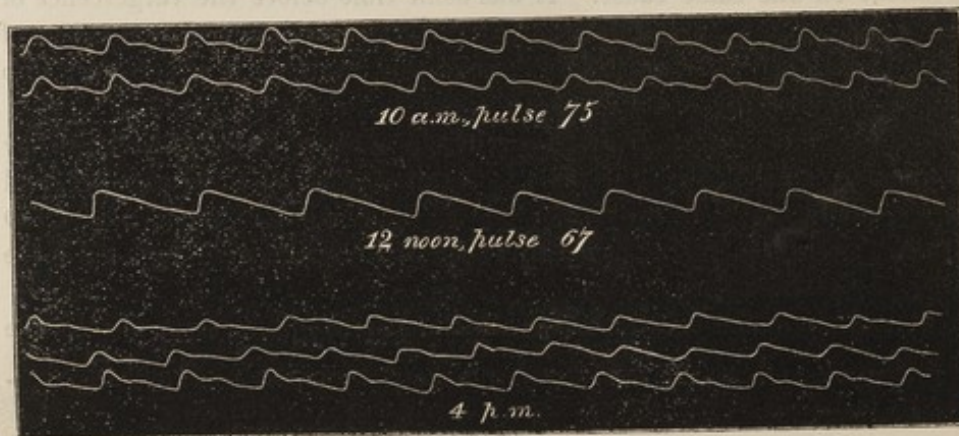
##### *Right Radial Artery.*

##### FIRST PERIOD.—8 DAYS WATER-DRINKING.

##### Second Day.



##### Third Day.

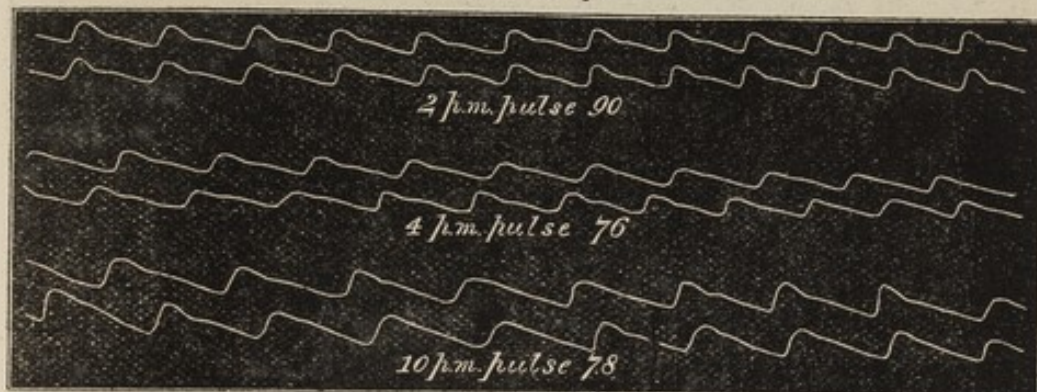




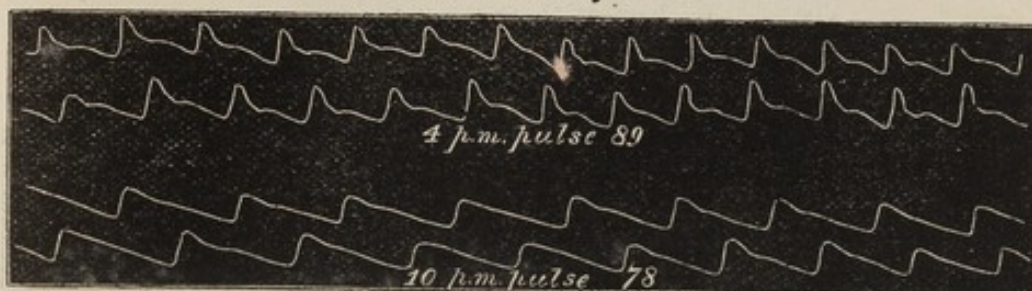
## Fourth Day.



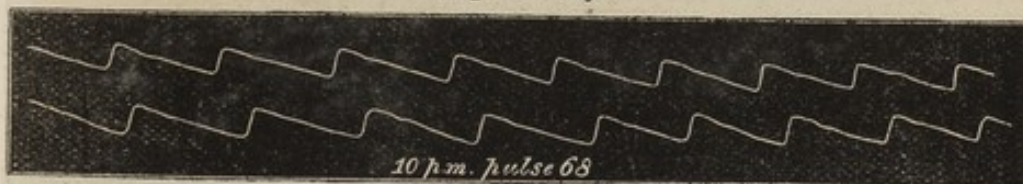
## Sixth Day.



## Seventh Day.



## Eighth Day.

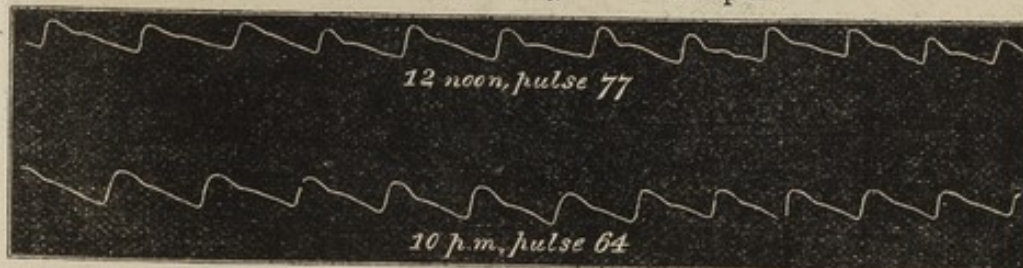


## SECOND PERIOD.—6 DAYS ALCOHOL.

## Ninth Day.

Half fluid ounce of alcohol at 8 a.m.

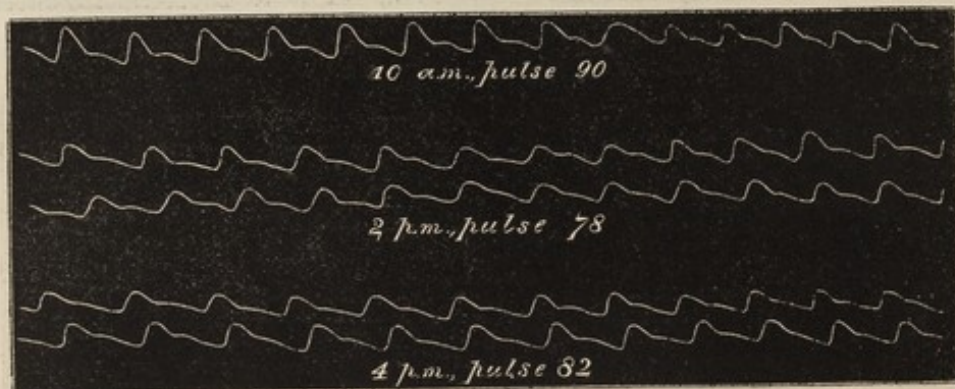
" " " 1.30 p.m.





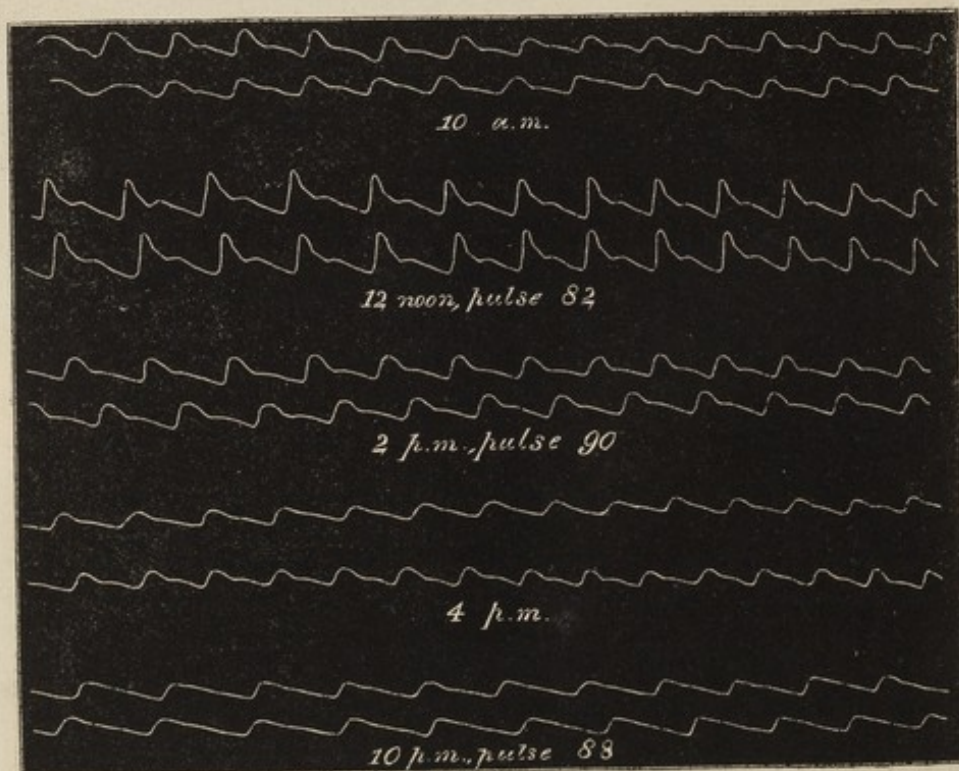
## Tenth Day.

One ounce of alcohol at 8 a.m.  
 " " " 1.30 p.m.



## Eleventh Day.

Two ounces of alcohol at 8 a.m.  
 One ounce " 1.30 p.m.  
 One " " 5 p.m.



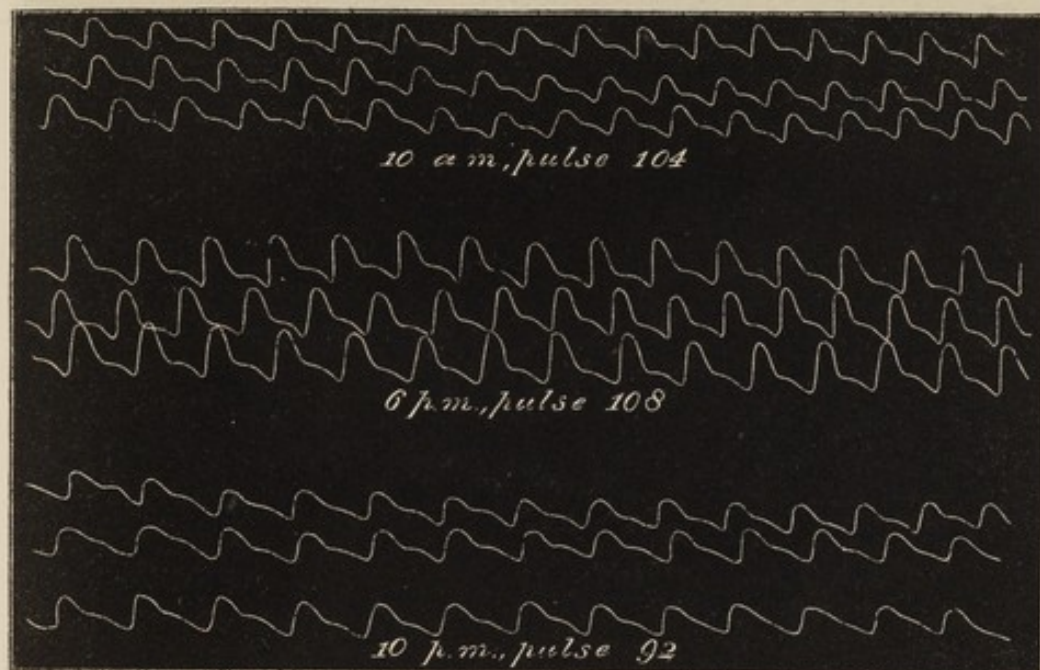


## Twelfth Day.

3 ounces of alcohol at 8 a.m.

1½ ounce        "        1.30 p.m.

1½        "        "        5 p.m.

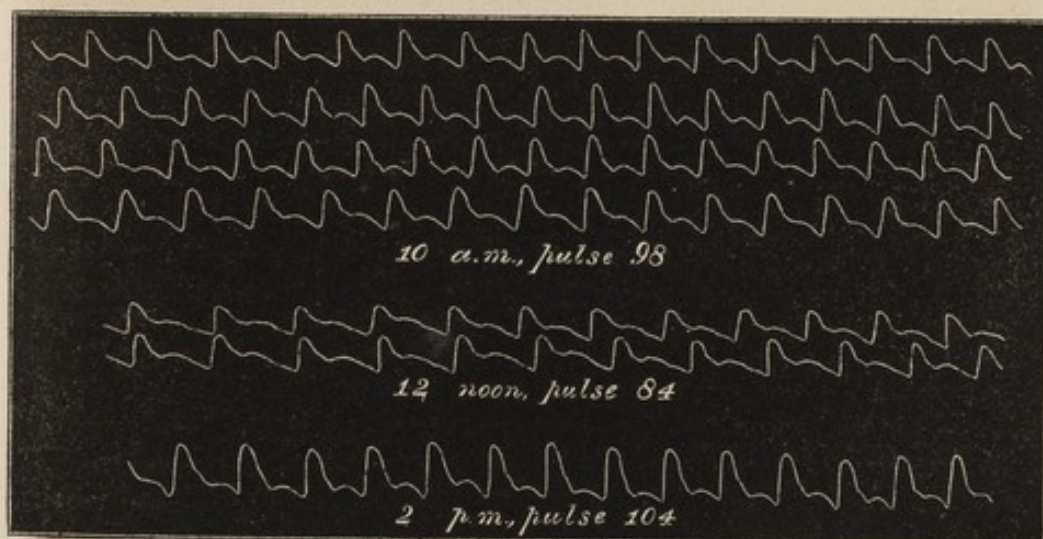


## Thirteenth Day.

3 ounces of alcohol at 8 a.m.

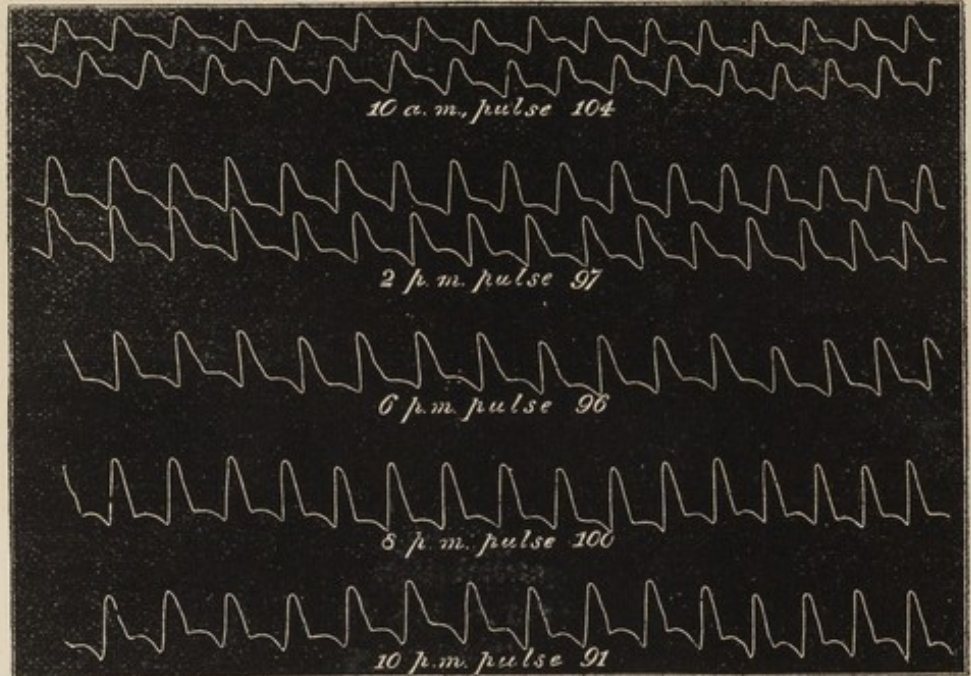
2½        "        "        1.30 p.m.

2½        "        "        5 p.m.



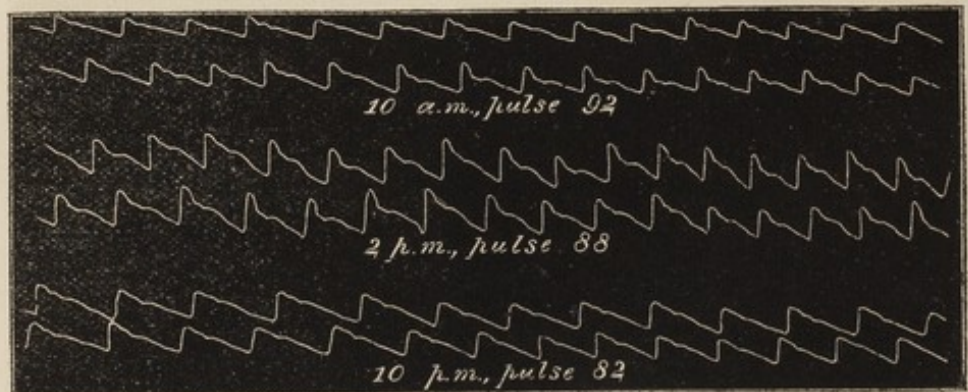


## Fourteenth Day.

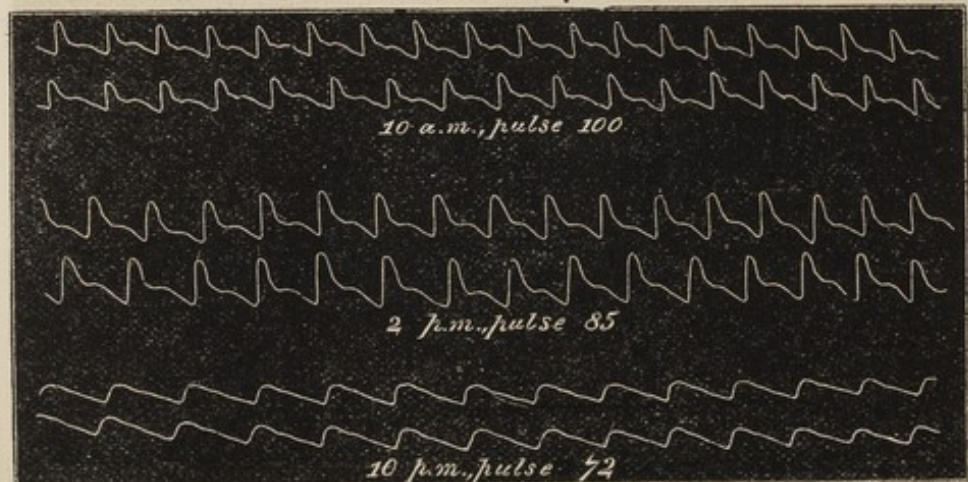
3 ozs. of alcohol at 8 a.m.— $2\frac{1}{2}$  ozs. of alcohol at 1.30 p.m.— $2\frac{1}{2}$  ozs. of alcohol at 5 p.m.

## THIRD PERIOD.—6 DAYS WATER-DRINKING.

## Fifteenth Day.

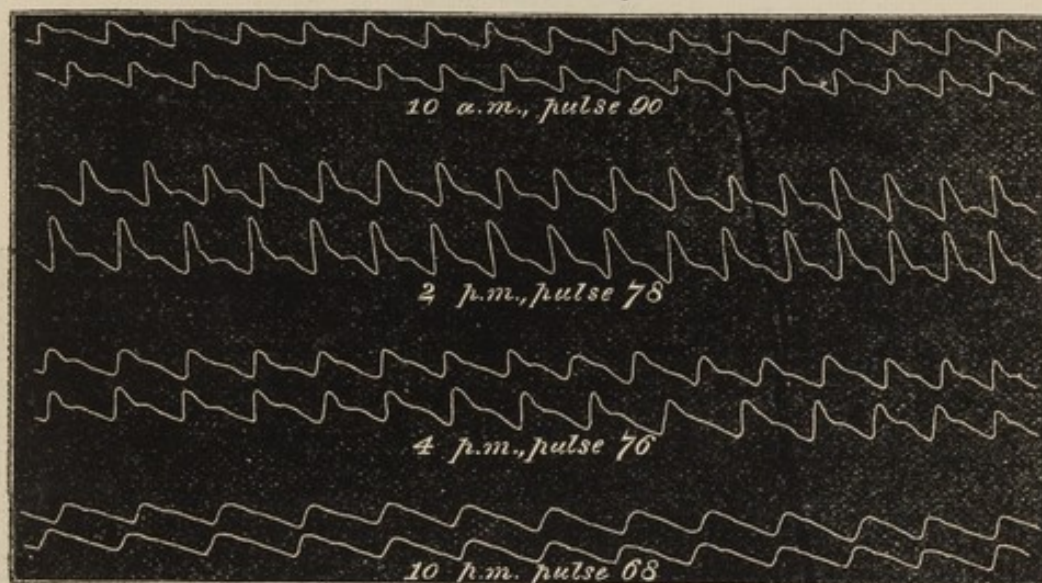


## Sixteenth Day.



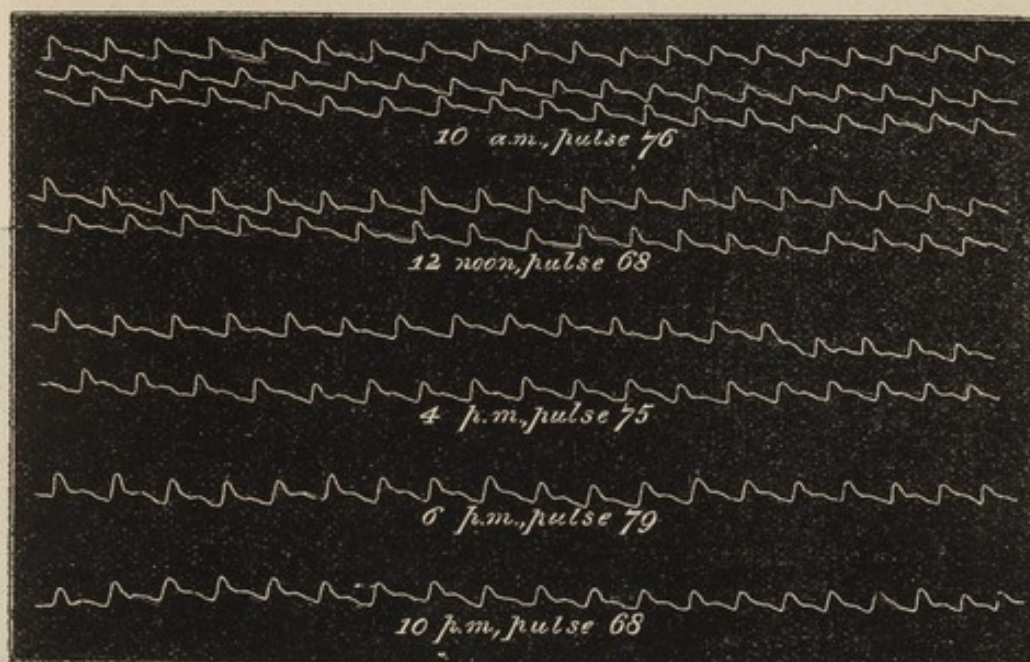


## Seventeenth Day.



## Eighteenth Day.

(A day of rest in bed.)



## Twentieth Day.

(The sixth day on water.)





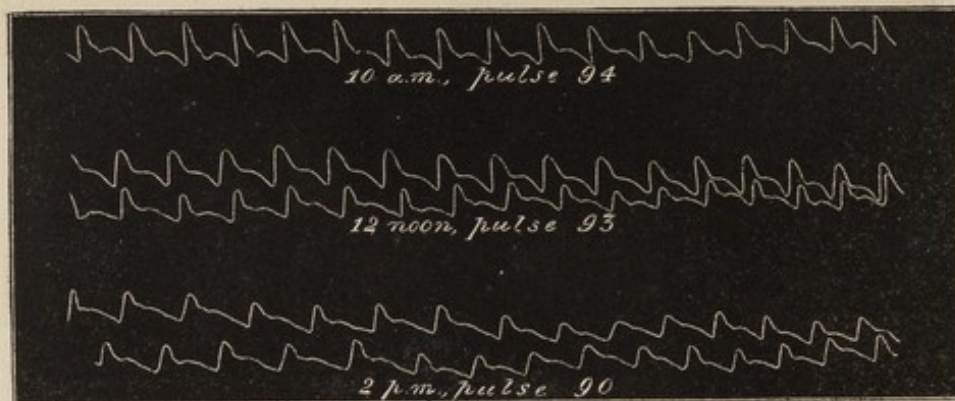
## FOURTH PERIOD.—3 DAYS BRANDY.

## Twenty-first Day.

Four ounces at 8 a.m.

" " 1.30 p.m.

" " 5 p.m.

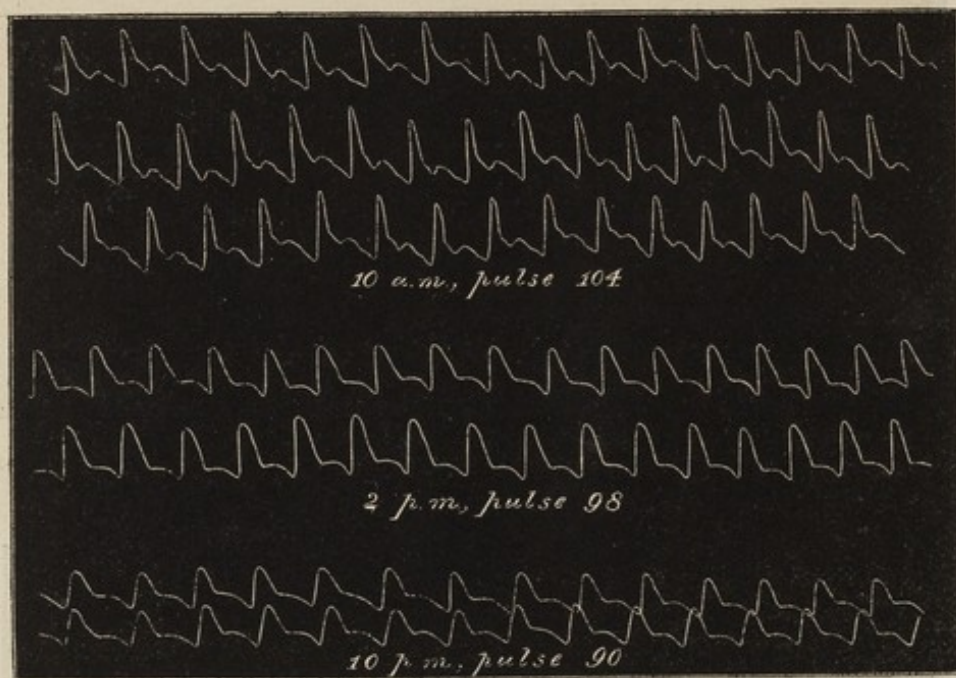


## Twenty-second Day.

Four ounces of brandy at 8 a.m.

" " 1.30 p.m.

" " 5 p.m.



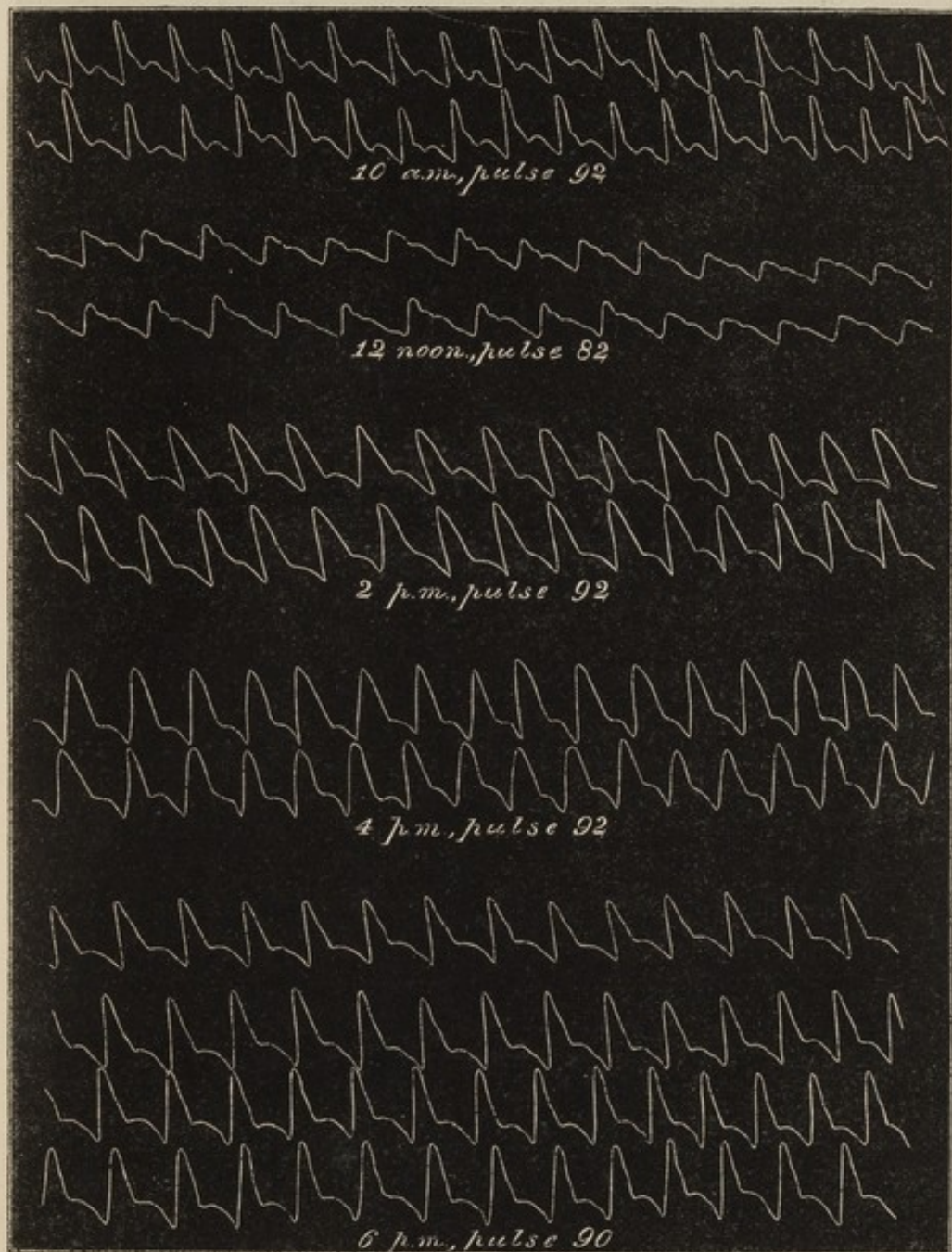


## Twenty-third Day.

Four ounces of brandy at 8 a.m.

" " 1.30 p.m.

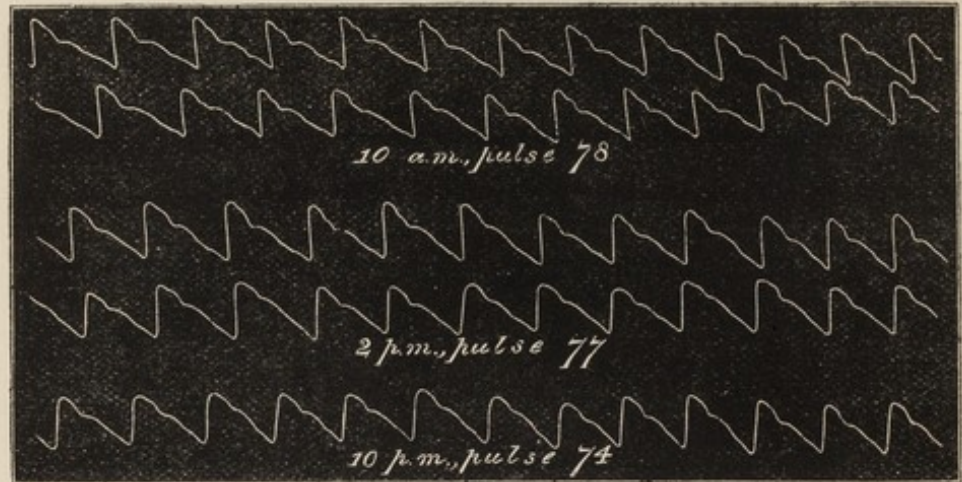
" " 5 p.m.



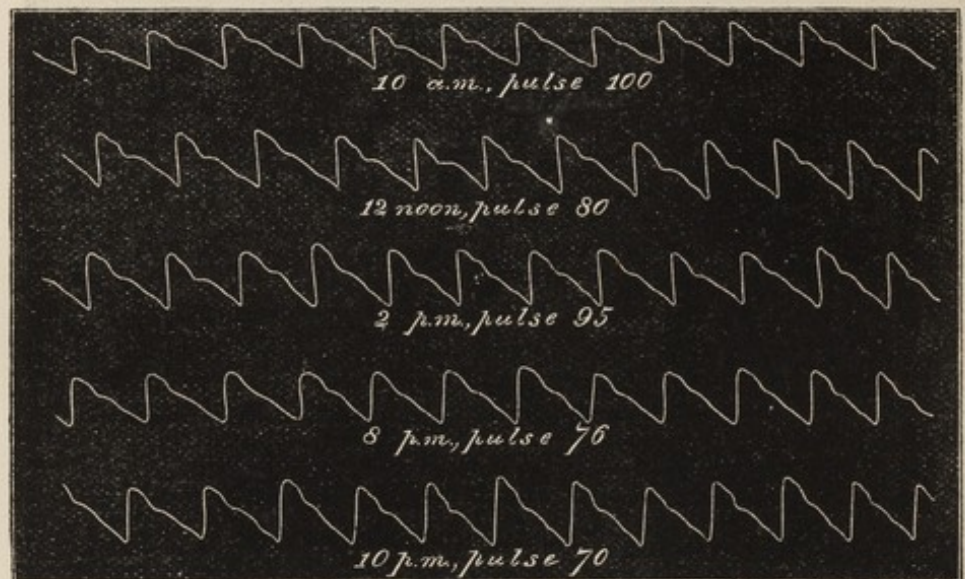


## FIFTH PERIOD.—WATER.

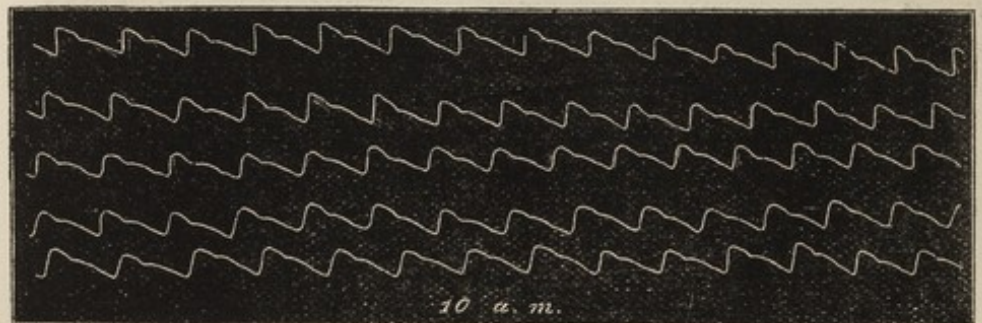
Twenty-fourth Day.



Twenty-fifth Day.



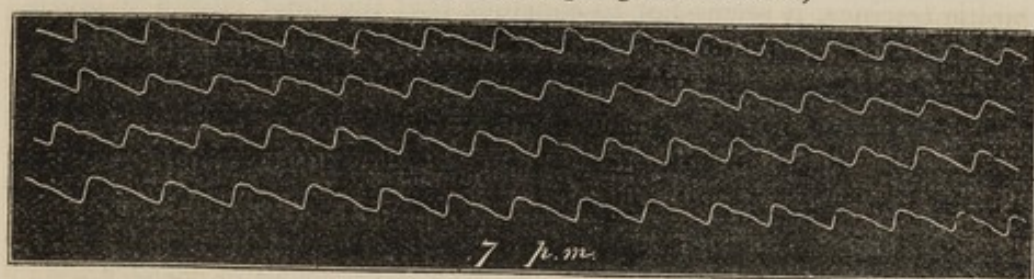
Twenty-seventh Day.





Seven days after.

(15 minutes after taking a glass of beer.)



After the alcohol was left off the tracings show indications of its influence, even to the sixth day. The tracing on the eighteenth day (the fourth after the cessation of alcohol) shows a weak and quickly acting heart; but allowance must be made for the fact that that was a day of complete rest in bed. On the sixth day after alcohol the mean pulse was 76.2 per minute, and the tracing shows still rapidity and feebleness of the heart's action. This seems to confirm the usual doctrine that increased rapidity of contraction from the action of alcohol is followed by exhaustion; but it also shows that this effect does not ensue so immediately as is supposed, but that the effect of the alcohol is more persistent.

When brandy was then given, the effect on the exhausted heart was very obvious; the ventricle commenced to contract again more rapidly, and, in fact, the effect of the brandy is more marked than that of alcohol.

It is difficult perhaps to explain all the indications of the brandy tracings, but there seems no doubt that the ventricular contraction was very sudden; the aortic valves opened with violence; a rapid wave traversed the blood, sending the lever up very high; the summit of the curve is sharp, and the equilibrium of tension between ventricle and artery must have been soon reached; the arteries emptied themselves very rapidly.

After the brandy was left off the tracings are seen gradually returning to the curve of health, though they had not reached it on the morning of the twenty-seventh day (the fourth after brandy), when the experiments were obliged to be discontinued.

Seven days later the pulse was nearly healthy again.

It is noticeable that twelve ounces of brandy (containing 48 per cent. of alcohol) had more effect than eight ounces of absolute alcohol, but it must be remembered that when the brandy was given the heart had not recovered from the influence of the alcohol; in other words, it was not perfectly healthy\*.

\* Dr. Burdon-Sanderson was kind enough to look at three tracings, No. 1 of the water period, No. 2 of the alcoholic period, and No. 3 of the brandy period. He writes as follows:—

"I think (1) that No. 1 is a normal pulse.

"(2) That the changes exhibited in Nos. 2 and 3 are of the same nature, but different in degree; *i. e.* that the degree of modification is greater in 3 than in 2. Hence the explanation of both must be the same.

"(3) The alteration of form is partly due to the mere increase of frequency; but in



Putting together the evidence derived from the pulse as felt by the finger, from the state of the cutaneous vessels, and from the sphygmographic tracings, it seems fair to conclude that the chief effects of alcohol on the circulation in health are on the ventricles (the rapidity with which contractions are accomplished being greatly increased), and on the capillaries (which are dilated and allow blood to pass more freely through them). The valuable observations of Dr. Anstie have shown that in many febrile cases, when alcohol is acting usefully, the arterial tension is increased; while in other cases, when there is narcotism, the tension is lowered. In this healthy man the effect of either small or large doses on the arterial tension is not perhaps well marked.

#### ACTION ON THE URINE.

##### *Elimination of water by the kidneys.*

| Days. | Fluid taken in twenty-four hours in food and drink.                            | Quantity of urine in c. c. |
|-------|--|----------------------------|
| 1     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1726                       |
| 2     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1197                       |
| 3     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1290                       |
| 4     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1220                       |
| 5     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 950                        |
| 6     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1167                       |
| 7     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1205                       |
| 8     | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1000                       |
| 9     | 71½ fluid ounces, or 2030 c. c., and 1 fluid ounce of alcohol ...              | 1300                       |
| 10    | 70½ fluid ounces, or 2002 c. c., and 2 fluid ounces of alcohol ...             | 1550                       |
| 11    | 69 fluid ounces, or 1959 c. c., and 4 fluid ounces of alcohol ...              | 1440                       |
| 12    | 67 fluid ounces, or 1902 c. c., and 6 fluid ounces of alcohol ...              | 1060                       |
| 13    | 65½ fluid ounces, or 1860 c. c., and 8 fluid ounces of alcohol ...             | 1800                       |
| 14    | 65½ fluid ounces, or 1860 c. c., and 8 fluid ounces of alcohol ...             | 1020                       |
| 15    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 980                        |
| 16    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1600                       |
| 17    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1400                       |
| 18    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1660                       |
| 19    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1180                       |
| 20    | 72½ fluid ounces of water, or 2059 c. c. ....                                  | 1110                       |
| 21    | { 66½ fluid ounces of water, or 1880 c. c., and 6 ounces of alcohol brandy ... | 1610                       |
| 22    | { 66½ fluid ounces of water, or 1880 c. c., and 6 ounces of alcohol brandy ... |                            |
| 23    | { 66½ fluid ounces of water, or 1880 c. c., and 6 ounces of alcohol brandy ... | 1270                       |
| 24    | { 66½ fluid ounces of water, or 1880 c. c., and 6 ounces of alcohol brandy ... |                            |
| 25    | 72½ fluid ounces, or 2059 c. c. ....   | 1260                       |
| 26    | 72½ fluid ounces, or 2059 c. c. ....   | 1100                       |
|       | 72½ fluid ounces, or 2059 c. c. ....   | 1330                       |
|       | 72½ fluid ounces, or 2059 c. c. ....   | 1580                       |

addition to this the tracing shows the special characters of the pulsus celer, the description of which in my book, page 14, seems still correct (*Handbook of the Sphygmograph*, 1867).

"(4) The celerity or shortness of the expansile movement I understand to signify that the left ventricle performs its contraction *within a shorter period*, and therefore uses more force within a given time than in its natural state.

"(5) I do not see any reason for supposing that the arterial pressure is increased."



The mean amounts are as follows :—

| Period.                                | Mean amount of<br>water taken in<br>food and drink.<br>cub. centims. | Mean amount<br>of<br>urine passed.<br>cub. centims. |
|--|--|---|
| First period (without alcohol) . . . . | 2059 . . . . .   | 1219  |
| Second period (with alcohol) . . . .   | 1935 . . . . .   | 1361  |
| Third period (with water) . . . . .    | 2059 . . . . .   | 1321  |
| Fourth period (with brandy) . . . .    | 1889 . . . . .   | 1380  |
| Fifth period (with water) . . . . .    | 2059 . . . . .   | 1337  |

As the amount of urine increased in the alcoholic period 142 cub. centims., while the water taken was less by 124 cubic centims., and the same result in a less degree occurred in the brandy period, there is no doubt that the alcohol increased the urinary water. Whether this was the consequence, as seems possible, of the greater frequency of the heart's action, or whether it arose from any purely diuretic influence of the alcohol, is uncertain. Was the body left poorer in water, or was the exit through the skin or lungs hindered?

As 4·3 ounces less of water passed in, and 5·3 ounces more passed out, in the alcoholic period, and as the mean amount of alcohol passing in was under 5 fluid ounces, the body ought to have lost weight, and perhaps would have done so but for one circumstance.

The possible amount of change of weight in this way would be of course slight, viz. about 4 ounces, and it happened that there was a less excretion of alvine matter (viz. 1 ounce less daily than during the first period), which would tend to cover the possible loss of water by the increased flow of urine. Also the error of the machine may be one ounce. We draw the conclusion that there was no decided evidence of lessening of elimination of water by other channels sufficient to account for the increased urinary flow.

#### *The Nitrogen of the Urine.*

The urea of 24 hours was determined by Liebig's mercuric nitrate solution, the chlorine being got rid of; and, in addition, the total nitrogen was determined by burning with soda-lime after the method of Voit, and leading the ammonia into a standard solution of sulphuric acid. In this way any error in the determination by either process was sure to be detected.



| Days. | Fluid taken.  | Urea, in grammes. | Nitrogen in urea, in grammes. | Nitrogen by soda-lime. |
|-------|---------------|-------------------|-------------------------------|------------------------|
| 1     | Water .....   | 37.000            | 17.266                        | 17.151                 |
| 2     | " .....       | 33.960            | 15.848                        | 16.142                 |
| 3     | " .....       | 33.080            | 15.437                        | 16.298                 |
| 4     | " .....       | 38.040            | 17.752                        | 17.752                 |
| 5     | " .....       | 33.540            | 15.652                        | 16.525                 |
| 6     | " .....       | 35.100            | 16.380                        | 16.070                 |
| 7     | " .....       | 30.980            | 14.457                        | 13.770                 |
| 8     | " .....       | 32.990            | 15.396                        | 14.555                 |
| 9     | Alcohol ..... | 35.938            | 16.771                        | 16.614                 |
| 10    | " .....       | 36.758            | 17.150                        | 17.387                 |
| 11    | " .....       | 32.126            | 14.992                        | 15.029                 |
| 12    | " .....       | 38.658            | 18.052                        | 20.300                 |
| 13    | " .....       | 34.047            | 15.890                        | 15.592                 |
| 14    | " .....       | 34.129            | 15.930                        | 15.715                 |
| 15    | Water .....   | 35.457            | 16.436                        | 16.700                 |
| 16    | " .....       | 40.352            | 18.831                        | 18.170                 |
| 17    | " .....       | 37.073            | 17.301                        | 17.890                 |
| 18    | " .....       | 35.000            | 16.330                        | 17.000                 |
| 19    | " .....       | 37.770            | 17.640                        | 17.690                 |
| 20    | " .....       | 31.224            | 14.571                        | 14.185                 |
| 21    | Brandy .....  | 34.357            | 16.030                        | 16.003                 |
| 22    | " .....       | 35.712            | 16.666                        | 17.140                 |
| 23    | " .....       | 34.344            | 16.027                        | 16.109                 |
| 24    | Water .....   | 34.677            | 16.182                        | 16.167                 |
| 25    | " .....       | 32.250            | 15.000                        | 15.108                 |
| 26    | " .....       | 36.780            | 17.165                        | 17.050                 |

The mean daily amounts are :—

|                              | Urea.    | Nitrogen in urea. | Nitrogen by soda-lime. |
|------------------------------|----------|-------------------|------------------------|
|                              | grammes. | grammes.          | grammes.               |
| First period (water) .....   | 34.336   | 16.023            | 16.033                 |
| Second period (alcohol)..... | 35.276   | 16.464            | 16.773                 |
| Third period (water).....    | 36.146   | 16.851            | 16.954                 |
| Fourth period (brandy).....  | 34.804   | 16.241            | 16.417                 |
| Fifth period (water) .....   | 34.569   | 16.115            | 16.108                 |

As 17.27 grammes of nitrogen (or probably a little more) entered with the food, and as, in the two stools which were examined, 1.6 and 2 grammes of nitrogen passed off respectively, it is certain that in this, as in other cases recorded, the whole of the nitrogen passed off by the kidneys and bowels, and none emerged by the skin or lungs. Of the  $17\frac{1}{4}$  or  $17\frac{1}{2}$  grammes which entered as food, 16 or  $16\frac{1}{2}$  passed off with the urine and  $1\frac{1}{4}$  or  $1\frac{1}{2}$ , or from  $\frac{1}{11}$  to  $\frac{1}{13}$ , by the bowels.

The effect of alcohol and brandy on the elimination of nitrogen was not great. In the alcoholic period there was a slight increase over the previous period, but this was dependent (partly, at any rate) on an accidental circumstance. On the twelfth day (during alcohol) the weather was very cold,



and the man had a chill ; there was slight shivering, pain in the hips, and frequent sneezing. The temperature of the axilla reached  $100^{\circ}$  at 6 P.M., and  $99^{\circ}2$  at 8 P.M. ; the temperature of the rectum at 10 P.M. was  $100^{\circ}2$ . The urine decreased greatly in amount (from 1440 cub. centims. to 1060 cub. centims.), and became very turbid from lithates. The urea increased to 38.65 grammes, giving 18.05 grammes of nitrogen, and the nitrogen by soda-lime was no less than 20.32 grammes. As this large excess surprised us, both processes were repeated three times with the same results ; and it is therefore to be concluded that, in consequence of this ephemeral fever, there was a larger amount of urea (*i. e.* of substances precipitated by mercuric nitrate), and also a great excess of nitrogenous substances not precipitated by mercuric nitrate.

On the following day the ephemeral fever was better, though the temperature was high in the early part of the day : the amount of urine then became excessive (1800 cub. centims.), but the urea and the nitrogen determined by soda-lime both fell to the average. If this fever-day be deducted, the average of the five remaining alcoholic-days gives 16.067 grammes of nitrogen, or practically the same as in the water-period.

We draw the conclusion that some, probably all, the excess of nitrogenous elimination during the alcoholic period was due to this transient fever, which, it may be noted, was neither hindered in coming on nor apparently prevented in passing off, by the 6 and 8 ounces of absolute alcohol which were taken on those days.

In the period after the alcohol the amount, both of ureal and total nitrogen, increased. The excess was chiefly due to a great elimination on the sixteenth day. On this day again a slight febrile attack recurred, and the temperature ran high. At 8 P.M. it reached  $100^{\circ}7$ , and then fell rapidly, so that at 10 P.M. it was normal in both axilla and rectum. The mean temperature of the day was  $98^{\circ}8$ , which was considerably higher than on any other day in this period.

On the following three days the nitrogen continued high, and fell on the next day far below the average. In the brandy period it continued to fall, and in the last period (three days of water-drinking) was almost precisely the same as in the first.

The disturbing influences from these febrile attacks being allowed for, and the small amount of the changes in the quantity of nitrogen, even if these attacks are included, being taken into account, it may be concluded that alcohol in the above quantities produces no effect of importance in altering the elimination of nitrogen in the healthy body when the ingress of nitrogen is constant. If any change does occur, which is not certain, it is on the side of increase ; and this might possibly be accounted for by the increased rapidity of the heart's action, and the augmented flow of urine, which would carry a little more urea with it.



Our conclusion is quite contrary to the observations formerly made on this subject, which indicated that nitrogen is largely retained in the body when alcohol is used, and that in this way alcohol both increases assimilation or, when food is deficient, saves the tissues from destruction and husband's strength. Whatever may be the case in febrile diseases (and on this point the evidence is defective), we are quite certain that this is not true for health, and that as long as the ingress of nitrogen is the same, 8 ounces of absolute alcohol and 12 ounces of brandy, containing nearly 6 ounces of alcohol, have no effect, or a trifling effect, on the processes which end in the elimination of nitrogen by the urine, and most decidedly do not lessen the elimination\*.

*The Phosphoric Acid, Chlorine, and Free Acidity of the Urine.*

The phosphoric acid was determined by nitrate of uranium, the chlorine by nitrate of silver, the acidity by the graduated alkaline solution:—

\* It may be noted with regard to the two processes for determining nitrogen, viz. precipitation by Liebig's mercuric nitrate and burning by soda-lime, that the mercuric nitrate throws down other nitrogenous matters besides the urea. Indeed, Voit considers (*Zeitschr. für Biologie*, Band ii. p. 470) that the total nitrogen in the urine of men may be safely concluded from this test. But this appears not to be so in all men. In the man now experimented upon, the nitrogen by soda-lime is actually very nearly the same as that calculated from the mercuric-nitrate precipitate. But in other men, and even in this man now and then, the former process gave a much larger result than the latter.

It will be observed that occasionally the process by soda-lime gives a smaller result than that by mercuric nitrate. The same fact is observable in the table given by Voit in the paper above referred to (p. 469). The explanation is probably this:—Possibly some of the non-ureal substances thrown down by mercuric nitrate may contain less nitrogen than urea, and the calculation is therefore incorrect; but the chief cause appears to be the following:—Both processes are liable to error. The mercuric nitrate being a colour test, is often difficult to estimate exactly; its failure is on the side of excess, and the amount of failure may be 2 or perhaps 3 per cent. On the other hand, the process by soda-lime has an error in the other direction: there is sometimes a difficulty in getting off the last traces of ammonia, and there may be therefore a slight error on the side of defect. If in any urine in which the amount of nitrogen by soda-lime ought really to coincide with that by mercuric nitrate, but in which each error of manipulation reaches its maximum limit (viz. that the mercuric-nitrate solution shows more nitrogen than exists, and the soda-lime process less), the amount of nitrogen by the latter plan may appear considerably less than by the former.



| Days. | Period.       | Phosphoric acid. | Chlorine. | Free acidity<br>=crystallized<br>oxalic acid. |
|-------|---------------|------------------|-----------|---|
|       |               | grammes.         | grammes.  | grammes.                                      |
| 1     | Water .....   | 2.554            | 10.507    | 2.119   |
| 2     | " .....       | 2.239            | 5.524     | 1.313   |
| 3     | " .....       | 2.161            | 7.342     | ...   |
| 4     | " .....       | 1.891            | 7.648     | 1.977   |
| 5     | " .....       | 1.876            | 4.584     | 2.483   |
| 6     | " .....       | 2.020            | 6.152     | ...   |
| 7     | " .....       | 1.711            | 7.265     | 2.173   |
| 8     | " .....       | 2.000            | 6.603     | 1.778   |
| Mean. |               | 2.056            | 6.915     | 1.974   |
| 9     | Alcohol ..... | 2.184            | 7.776     | 2.174   |
| 10    | " .....       | 2.821            | 7.126     | 2.592   |
| 11    | " .....       | 2.117            | 7.082     | 2.485   |
| 12    | " .....       | 2.400            | 7.826     | 2.345   |
| 13    | " .....       | 1.870            | 7.508     | 2.116   |
| 14    | " .....       | 1.990            | 8.780     | 2.292   |
| Mean. |               | 2.228            | 7.586     | 2.342   |
| 15    | Water .....   | 2.107            | 6.608     | 2.930   |
| 16    | " .....       | 2.560            | 9.656     | 1.633   |
| 17    | " .....       | 2.716            | 10.437    | 1.902   |
| 18    | " .....       | 2.407            | 9.267     | 2.035   |
| 19    | " .....       | 2.690            | 8.796     | 2.840   |
| 20    | " .....       | 1.953            | 6.698     | 1.909   |
| Mean. |               | 2.405            | 8.577     | 2.208   |
| 21    | Brandy .....  | 2.592            | 8.773     | 2.525   |
| 22    | " .....       | 2.413            | 10.363    | 2.656   |
| 23    | " .....       | 1.890            | 10.735    | 2.171   |
| Mean. |               | 2.298            | 9.943     | 2.451   |
| 24    | Water .....   | 2.233            | 7.712     | 2.307   |
| 25    | " .....       | 2.367            | 9.206     | 1.391   |
| 26    | " .....       | 2.607            | 11.218    | 2.520   |
| Mean. |               | 2.405            | 9.378     | 2.073   |

The changes in the phosphoric acid are so slight, that it is certain the alcohol exerted little effect. Thus, the mean of the first period being 2.056 grammes, on the two last days of the alcohol period, when 8 ounces of absolute alcohol were taken each day, the amount of phosphoric acid was 1.87 and 1.99 grammes respectively, which is the same as the mean of the first period. Now, if alcohol exerted any effect, we should expect these two days to show it. The mean of the next, or water period, when the body was in reality still impregnated with alcohol, was a little more (2.405 grammes). On the third day of brandy, when a bottle and a half had been taken in three days, the excretion was 1.89 gramme, or practically the same as in the first period.

Looking to the amounts of phosphoric acid excreted on the two last alcoholic days and the last brandy day, when the effect of the spirit, if any, would be most marked, it seems clear, if the phosphoric acid in the urine be in any way a measure of the metamorphosis of the nervous tissue (which



we do not affirm), that these experiments do not warrant any assertion that the alcohol interferes with such metamorphosis. The phosphoric acid was in fact unaffected even by such large quantities as 454 cub. centims., or not much less than  $\frac{1}{2}$  litre of absolute alcohol in 48 hours.

The chlorine was in larger quantities in the latter period of the experiments; but whether this was owing to the alcohol is doubtful. As the chlorine also passes off by the skin and bowels, variations in the amount eliminated by these channels affect the urine. On the 10th of February cold weather set in, and continued until the 18th; and it seems probable that some lessened action of the skin caused more chloride of sodium to pass in the urine.

The free acidity appeared to be increased in the alcoholic, and still more in the brandy period; but whether the increase is large enough to take it out of the limits of usual variation is not certain. It seems singular, if alcohol increases the free acidity, that on the two days when 8 fluid ounces were taken each day, the acidity was less than two days in the first period, and less than on the second alcoholic days, when only 2 ounces of alcohol were taken.

The acidity during the three brandy days was, however, high throughout, and it fell afterwards considerably, so that probably brandy does somewhat increase the acidity.

It is noticeable that the febrile attack on the twelfth day, which so influenced the nitrogen, and caused a large deposit of urates, was without influence on the free acidity.

On the whole, it may be concluded that the influence of alcohol on these three urinary constituents is inconsiderable.

#### THE ALVINE DISCHARGES.

The discharges from the bowels were weighed every day; they were always natural except on the two first days, when there was some looseness. On those days the stools were rather liquid, and weighed  $13\frac{1}{4}$  and  $11\frac{1}{2}$  ounces. Excluding these discharges, the mean numbers are as follows:—

|   | Weight in ounces<br>avoirdupois. | Weight in<br>grammes. |
|---|----------------------------------|-----------------------|
| First period (water, last 6 days) . . . . | 4.81 . . . . .                   | 136.6                 |
| Second period (alcohol) . . . . .         | 3.8 . . . . .                    | 107.9                 |
| Third period (water) . . . . .            | 3.04 . . . . .                   | 86.34                 |
| Fourth period (brandy) . . . . .          | 5.35 . . . . .                   | 166                   |
| Fifth period (water) . . . . .            | 3.41 . . . . .                   | 96.8                  |

The nitrogen was determined twice, viz. on the fifth day (water), and on the 12th day (6 ounces of alcohol); it amounted to 1.639 and 2.087 grammes respectively.

The alcohol, therefore, did not lessen the elimination of nitrogen by the bowels; and, considering the usual great variations in the weights of the stools from day to day, it is probable that it did not lessen their amount.



## THE PULMONARY EXCRETION.

On this point we made no experiments. The method of Professor von Pettenkofer has accustomed physiologists to such accuracy in the determination of the elimination of carbon, and there is so general a feeling that this method, as dealing with long periods, is the best that can be employed, that, as we had not Pettenkofer's appliances, we preferred doing nothing to falling short of a perfectly satisfactory and unquestionable result.

## THE ELIMINATION OF ALCOHOL.

The question as to the destruction or otherwise of alcohol in the body is very difficult to answer, owing to the impossibility of collecting all the excreta. The experiments of Schulinus, and especially of Anstie and Dupré, seem to show clearly that only a small part can be recovered from the body of animals or from the excreta. The latter authors, by using the bichromate of potassium and sulphuric-acid solution as a colour-test, and also by converting the alcohol into acetic acid and estimating it by an alkaline solution, could only prove the elimination of very small quantities by the urine; and the elimination was soon accomplished.

Owing to the number of experiments we had to make, we found we could not attempt to solve this very difficult question of elimination; and we will here merely briefly give the qualitative observations which alone we were able to make, and which, as far as they go, confirm the results arrived at by Perrin and Lallemand, Edward Smith, and others.

We used for this purpose the chromate test proposed by Masing, and used by most observers since.

*Elimination by the Lungs.*

During the first or water period, the man breathed several times daily, for 15 minutes at a time, through the solution of bichromate of potassium in sulphuric acid, without any change of colour being produced. On the fifth day (water) he breathed through a glass tube surrounded by a freezing mixture. About 1.7 cub. centim. of fluid were obtained, which gave no green reaction with the test. On the first day of alcohol (1 fluid ounce) no alcohol was indicated in the breath by the test; on the second day (2 fluid ounces) the test was slightly affected; on the four following days (4, 6, 8, and 8 ounces of alcohol) markedly so, but with variable intensity at different times of the day.

On the last day of alcohol the water in the breath was condensed during 15 minutes, in a glass tube surrounded by ice; .7 cub. centim. of fluid were obtained, which gave a strong green reaction with the bichromate test.

On the following day breathing had no effect on the fluid.

During the brandy days the breath always produced a green tint, and usually it was very marked.

We did not attempt any determination of quantity by this colour test; and Anstie has pointed out that the bichromate test is so delicate that the



quantity passing off may easily be overrated; but it can hardly be doubted that in twenty-four hours there must be a good deal of elimination by this channel.

*Elimination by the Skin.*

On the seventh day, when only water was taken, the whole arm was placed in a glass jar, which was closed by india-rubber. A little fluid was collected, which gave no evidence of alcohol with the bichromate test.

In the afternoon of the eleventh day (the third of alcohol), when he had taken seven fluid ounces in three days, the arm was enclosed for six hours in the glass jar. About 12 c. c. of an acid fluid were collected; a small quantity of which gave an immediate and strong green reaction with the bichromate test.

On the fourteenth day (the sixth of alcohol), the arm was again enclosed in the jar, and 8 c. c. of an opalescent fluid collected, which gave a very decided reaction with the bichromate.

On the twenty-third day (the third of brandy) the arm was again placed in the jar for six hours; 10 c. c. of an acid fluid collected, which gave a strong green reaction with the bichromate test.

The general result of these experiments indicated that the skin is a considerable emunctory of alcohol, perhaps more so than the lungs, if the bichromate test is a safe one, which we are inclined to doubt.

*Elimination by the Kidneys.*

The examination was conducted as follows:—250 c. c. of the urine without any addition were placed in a large retort and distilled at a low heat, till about 150 c. c. had passed over. It was tested with bichromate; then 50 c. c. were redistilled, and about 15 c. c. were allowed to pass over. The following table gives the results:—

| Day. | Fluid taken.                                     | Reaction of first distillate with bichromate test. | Reaction of second distillate with bichromate test. |
|------|--|--|---|
| 3.   | Water.....                                       | None.  |   |
| 9.   | Alcohol, 1 fluid ounce ...                       | None.  | None.   |
| 10.  | Alcohol, 2 fluid ounces...                       | None.  | Distinct.   |
| 11.  | Alcohol, 4 fluid ounces...                       | Slight.  | Distinct.   |
| 12.  | Alcohol, 6 fluid ounces..                        | Distinct.  | Very strong.  |
| 13.  | Alcohol, 8 fluid ounces...                       | Very strong.                                       | Very strong.  |
| 14.  | Alcohol, 8 fluid ounces...                       | Very strong.                                       | Very great.   |
| 20.  | { Water, and the same for<br>5 days before ..... | Very slight, just possible to be affirmed.         |   |
| 21.  | Brandy, 12 fluid ounces.                         | Very strong.                                       |   |
| 22.  | Brandy, 12 fluid ounces.                         | Very strong.                                       |   |
| 23.  | Brandy, 12 fluid ounces.                         | Very strong.                                       |   |

This table shows distinctly that with one ounce of alcohol in twenty-four hours, none was detected in the urine of that day; it was detected when two fluid ounces were taken; and then, as the amount of alcohol was increased, more and more passed into the urine, until at last the reaction



became very strong. As to the exact amount of alcohol passing off, we can say nothing; but, looking to the delicacy of the test, it was probably not great.

In the case of the brandy, we attempted on the first day to determine the quantity by the method of Dupré, viz. converting the alcohol into acetic acid by heating with chrome-alum.

The results indicated rather a larger quantity than he found; but still the amount was small. In the whole day's urine only .1763 gramme, or 2.7 grains of alcohol were discoverable by this method.

#### *Elimination by the Bowels.*

The stools were mixed with distilled water; and after standing for seven or eight days in covered vessels, the water was poured off, and 30 c. c. were distilled from 250 c. c.

| Day. | Fluid taken. | Reaction of distillate with the bichromate test. |
|------|--------------|--|
| 11.  | Alcohol.     | Decided, but not great.                          |
| 12.  | "            | "  |
| 13.  | "            | "  |
| 14.  | "            | "  |

We think it can scarcely be doubted that the elimination of alcohol does not take place so rapidly as is supposed. Looking to the evidence of the pulse, of the sphygmographic tracings, and of the urine on the twentieth day, we must conclude that, twenty-nine fluid ounces of absolute alcohol having been taken in six days, the body had still traces of it on the sixth day after the alcohol was left off.

The evidence of Anstie and Dupré is certainly strong against the urine being a great channel of elimination; but possibly, though not excessive at any one time, the exit is longer continued than they supposed; and when the constant passage from the skin and from the lungs and bowels is remembered, we can easily suppose that the totality of elimination may be really considerable.

But whether all the alcohol thus passes off, or whether some is destroyed, our experiments do not enable us to state.

#### GENERAL CONCLUSIONS.

1. One and two fluid ounces (28.4 c. c. and 56.8 c. c.) of absolute alcohol given in divided quantities in 24 hours to a perfectly healthy man seemed to increase the appetite. Four fluid ounces lessened it considerably; and larger quantities almost entirely destroyed it. On the last day of alcohol the man was three quarters of an hour eating 8 ounces of bread, and could hardly do so. Had he been left to his own wishes the amount of food taken would have been much diminished.

It appears, therefore, that in this individual some point near 2 fluid ounces of absolute alcohol is the limit of the useful action on appetite; but



it is possible that if the alcohol had been continued a smaller quantity would have lessened appetite.

In other healthy persons it may be different from the above; in most cases of disease, when digestion is weakened, it seems probable that a much smaller amount of alcohol would destroy appetite.

2. The average number of beats of the heart in 24 hours (as calculated from 8 observations made in 14 hours), during the first or water period, was 106,000; in the alcoholic period it was 127,000, or about 21,000 more; and in the brandy period it was 131,000, or 25,000 more.

The highest of the daily means of the pulse observed during the first or water period was 77.5; but on this day two observations are deficient. The next highest daily mean was 77 beats.

If instead of the mean of the 8 days or 73.57 we compare the mean of this one day, viz. 77 beats per minute, with the alcoholic days, so as to be sure not to overestimate the action of the alcohol, we find:—

On the 9th day, with 1 fluid ounce of alcohol, the heart beat 4,300 times more.

On the 10th day, with 2 fluid ounces, 1872 times more.

On the 11th day, with 4 fluid ounces, 12,960 times more.

On the 12th day, with 6 fluid ounces, 30,672 times more.

On the 13th day, with 8 fluid ounces, 23,904 times more.

On the 14th day, with 8 fluid ounces, 25,488 times more.

But as there was ephemeral fever on the 12th day, it is right to make a deduction, and to estimate the number of beats in that day as midway between the 11th and 13th days, or 18,432. Adopting this, the mean daily excess of beats during the alcoholic days was 14,492, or an increase of rather more than 13 per cent.

The first day of alcohol gave an excess of 4 per cent., and the last of 23 per cent.; and the mean of these two gives almost the same percentage of excess as the mean of the 6 days.

Admitting that each beat of the heart was as strong during the alcoholic period as in the water period (and it was really more powerful), the heart on the last two days of alcohol was doing one-fifth more work.

Adopting the lowest estimate which has been given of the daily work done by the heart, viz. as equal to 122 tons lifted one foot, the heart during the alcoholic period did daily work in excess equal to lifting 15.8 tons one foot, and in the last two days did extra work to the amount of 24 tons lifted as far.

The period of rest for the heart was shortened, though perhaps not to such an extent as would be inferred from the number of beats; for each contraction was sooner over.

The heart on the fifth and sixth days after alcohol was left off, and apparently at the time when the last traces of alcohol were eliminated, showed in the sphygmographic tracings signs of unusual feebleness; and, perhaps in consequence of this, when the brandy quickened the heart again, the



tracings show a more rapid contraction of the ventricles, but less power than in the alcoholic period. The brandy acted, in fact, on a heart whose nutrition had not been perfectly restored.

The peripheral circulation was accelerated and the vessels were enlarged; and the effect was so marked as to show that this is an important influence for good or for evil when alcohol is used.

Referring only to this healthy man, it is clear that the amount of alcohol the heart will bear without losing its healthy sphygmographic tracing is small, and it must be supposed that some disease of heart or vessels would eventually follow the overaction produced by large doses of alcohol.

3. Although large doses of alcohol lessened appetite, they did not appear to impede primary digestion, as far as this could be judged of by the sensations of the man; nor did they seem to check the normal chemical changes in the body which end in the elimination of nitrogenous excreta, of phosphoric acid, and of free acidity. In other words, we were unable to trace either the good or the evil ascribed to alcohol in this direction: it neither depressed these chemical changes nor obviously increased them; it neither saved the tissues nor exhausted them; and even in the period of ephemeral fever its effects were negative.

But, of course, in these experiments we were not dealing with diseased tissues, nor with structures altered in composition by long-continued excess of alcohol. The results in such cases might be different; and it may be desirable to repeat that though appetite was lessened, the amount of food taken was the same each day.

4. Neither pure alcohol nor brandy, in the quantities given, lessened the temperature; in other words, they did not arrest the chemical changes which produce animal heat, or lessen the processes which regulate its amount, any more than they influenced nitrogenous tissue-change. Alcohol in no way influenced the rise of temperature during the attack of ephemeral fever; it neither lowered nor increased it. This appears to us conclusive against the proposal to use alcohol as a reducer of febrile heat.

On the other hand it is not clear that alcohol increased the temperature: it produced subjective feelings of warmth in the stomach, in the face, round the loins, and over the shoulders; but at the time when these were felt (for about one hour after tolerably large doses) the thermometer in the axilla and rectum showed no rise. This is best seen by comparing the two o'clock observations, which were taken about half an hour after dinner. The feelings result from the enlargement of the vessels and the greater flow of blood through them; so, also, the ephemeral fever was decidedly not made worse by it.

5. An effect on the nervous system was not proved by any evidence of increase or decline in the amount of phosphoric acid; but there were marked subjective feelings; and possibly also the increased action of the heart was a nervous condition, as the short contractions of the ventricle were like those ascribed to alterations in the nervous currents. The feelings which



were produced by four fluid ounces daily, and in a still higher degree by the larger quantities of alcohol, proved that narcotism was produced. There was no exhilaration, but a degree of heaviness, indisposition to exertion, and loss of cheerfulness and alacrity; there was slight headache, and even some torpor and sleepiness. All these effects were more marked with brandy. The commencement of narcotism was therefore produced in this man by some quantity much less than 4 fluid ounces, and probably nearer 2. It was nearly this amount which also commenced to destroy the appetite; and it may also be observed that a considerable rise in the frequency of the pulse occurred on the third day of alcohol, when 4 ounces were taken, whereas on the days with one or two ounces the pulse, though quickened, was so in a much less degree.

Putting therefore these points together, viz. that the obvious effect on the nervous system (*i. e.* narcotism), the loss of appetite, and a great rise in the quickness and frequency of the heart's beats occurred at the same time, it seems fair to conclude that there must be a relation between the phenomena, or, in other words, that all were owing to nervous implication.

It appears, then, clear that any quantity over two ounces of absolute alcohol daily would certainly do harm to this man; but whether this, or even a smaller quantity, might not be hurtful if it were continued day after day, the experiments do not show. It is quite obvious that alcohol is not necessary for him; that is, that every function was perfectly performed without alcohol, and that even one ounce in twenty-four hours produced a decided effect on his heart, which was not necessary for his health, and perhaps, if the effect continued, would eventually lead to alterations in circulation, and to degeneration of tissues. It is not difficult to say what would be excess for him; but it is not easy to decide what would be moderation; it is only certain that it would be something under two fluid ounces of absolute alcohol in twenty-four hours.

It will be seen that the general result of our experiments is to confirm the opinions held by physicians as to what must be the indications of alcohol both in health and disease. The effects on appetite and on circulation are the practical points to seize; and if we are correct in our inferences, the commencement of narcotism marks the point when both appetite and circulation will begin to be damaged. As to the metamorphosis of nitrogenous tissues or to animal heat, it seems improbable that alcohol in quantities that can be properly used in diet has any effect; it appears to us unlikely (in the face of the chemical results) that it can enable the body to perform more work on less food, though by quickening a failing heart it may enable work to be done which otherwise could not be so. It may then act like the spur in the side of a horse, eliciting force, though not supplying it.

The employment of alcohol in health and disease is so great a subject that we should have felt tempted to extend these remarks to some points of medical practice, had it been desirable to do so in this place. We will only say that while we recognize in these experiments the great practical



use of alcohol in rousing a failing appetite, exciting a feeble heart, and accelerating a languid capillary circulation, we have been strongly impressed with the necessity for great moderation and caution. In spite of our previous experience in the use of alcohol and brandy, we were hardly prepared for the ease with which appetite may be destroyed, the heart unduly excited, and the capillary circulation improperly increased. Considering its daily and almost universal use, there is no agent which seems to us to require more caution and more skill to obtain the good and to avoid the evil which its use entails.

We wish to guard ourselves against the supposition that in speaking of alcohol and brandy we refer at all to wine and beer, which contain substances, in addition to alcohol, which may make their action in nutrition somewhat different.







No. 25

## EXPERIMENTS

ON THE

### ACTION OF RED BORDEAUX WINE (CLARET)

#### ON THE HUMAN BODY.

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In the Proceedings of the Royal Society (No. 120) is an account of some experiments with pure alcohol and brandy on a healthy man. This paper is intended as a continuation, with the substitution in the experiments of red Bordeaux wine (claret) for alcohol and brandy. The same



man was the subject of the experiments, and he was placed on precisely the same diet as is recorded in the former paper.

The experiments were continued for 30 days, the man having abstained from any alcoholic beverage for 16 days previously. During the first 10 days, water only was taken at dinner, during the next 10 days red Bordeaux wine was substituted for the water; 10 fluid ounces (284 cub. centims.) being given on the first 5 days, and 20 fluid ounces (568 cub. centims.) on the last 5 days. The wine was taken at dinner time, at a quarter past 1 o'clock. In the last 10 days water was again given.

The wine was a good claret, as it was thought best to use a superior wine; it was Haut Brion wine of second growth, of the vintage of 1863, and was sold in London at the price of 60s. per dozen. It contained 11 per cent. of alcohol. The free acidity was equal to about 3 grains per ounce of tartaric acid ( $C_4H_6O_6$ ); the total solids amounted to 21.76 grammes, and the fire-proof salts to 2.359 grammes per litre. Of this amount of salts 2.027 grammes were soluble, and .332 insoluble. In the former, phosphoric acid and chlorine were present in the amounts of .145 and .106 gramme per litre respectively; the insoluble salts contained only .0175 gramme of phosphoric acid per litre. In the 10 ounces of wine there were therefore only 0.7 grain of phosphoric acid, and 0.46 grain of chlorine.

The ash was intensely alkaline, and, when neutralized with standard acid, the alkalinity was found to be equal to 1.679 gramme of tartaric acid ( $C_4H_6O_6$ ) per litre.

Only two circumstances (except the taking of wine) were different in this set of experiments as compared with the former.

The first experiments were made in February and March 1870, when the weather was very cold; the present were made in May and June in very hot and dry weather. The only influence we could trace to this altered condition of climate was that the amount of water allowed was insufficient, and the man suffered some discomfort from thirst. We could not perceive that any effect was produced on the nitrogenous elimination; certainly there was no diminution.

The other alteration was that the man had gained 4 lbs. in weight, and was still gaining a little when the experiments were commenced; he continued to do so slowly until the 24th day, when his health began to give way and he lost weight.

The experiments included the number of the pulse (taken in the recumbent position) every 2 hours from 8 A.M. to 10 P.M., tracings of the pulse and respirations, the temperature of the axilla every 2 hours from 6 A.M. to 10 P.M., the temperature of the rectum four times a day (the observations being taken with the same thermometers as on the former occasion), the amounts of nitrogen, phosphoric acid, chlorine and free acidity of the urine, and the weight, and in the two cases the amount of nitrogen in the stools.



## 1. WEIGHT OF THE BODY

(taken at 8 a.m. before breakfast and after emptying the bladder).

| Days. | Weight,<br>in lbs. | Weight,<br>in kilo-<br>grammes. | Days. | Weight,<br>in lbs. | Weight,<br>in kilo-<br>grammes. | Days. | Weight,<br>in lbs. | Weight,<br>in kilo-<br>grammes. |
|-------|--------------------|---------------------------------|-------|--------------------|---------------------------------|-------|--------------------|---------------------------------|
| 1.    | 140                | 63.6                            | 11.   | 140.5              | 63.86                           | 21.   | 140.5              | 63.86                           |
| 2.    | 140                | 63.6                            | 12.   | 140.5              | 63.86                           | 22.   | 140.6              | 63.91                           |
| 3.    | 140                | 63.6                            | 13.   | 140.6              | 63.91                           | 23.   | 140.6              | 63.91                           |
| 4.    | 140                | 63.6                            | 14.   | 140.6              | 63.91                           | 24.   | 140.6              | 63.91                           |
| 5.    | 140                | 63.6                            | 15.   | 140.6              | 63.91                           | 25.   | 140.5              | 63.86                           |
| 6.    | 140.5              | 63.86                           | 16.   | 140.6              | 63.91                           | 26.   | 140.4              | 63.81                           |
| 7.    | 140.5              | 63.86                           | 17.   | 140.6              | 63.91                           | 27.   | 140.3              | 63.77                           |
| 8.    | 140.5              | 63.86                           | 18.   | 140.6              | 63.91                           | 28.   | 140                | 63.6                            |
| 9.    | 140.5              | 63.86                           | 19.   | 140.5              | 63.86                           | 29.   | 140                | 63.6                            |
| 10.   | 140.5              | 63.86                           | 20.   | 140.5              | 63.86                           | 30.   | 140                | 63.6                            |
| Means | 140.25             | 63.75                           | ..... | 140.55             | 63.863                          | ..... | 140.35             | 63.79                           |

Owing to the rather larger supply of food and the lessened exercise the weight increased slightly, but remained, on the whole, in tolerable equilibrium until the 24th day, when he became indisposed, and lost weight regularly every day for 4 days. No obvious change in weight was caused by the wine.

## 2. THE CIRCULATION.

Pulse before wine (taken in the recumbent position.)

| Days.       | Hours. |         |          |        |        |        |        |         | Mean of<br>the days. |
|-------------|--------|---------|----------|--------|--------|--------|--------|---------|----------------------|
|             | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. | 10 P.M. |                      |
| 1st day ... | 74     | 86      | 74       | 84     | 77     | 84     | 72     | 72      | 77.87                |
| 2nd day ... | 67     | 72      | 72       | 82     | 77     | 80     | 75     | 70      | 74.37                |
| 3rd day ... | 71     | 80      | 72       | 82     | 76     | 82     | 85     | 72      | 77.5                 |
| 4th day ... | 65     | 75      | 80       | 89     | 73     | 73     | 78     | 67      | 75                   |
| 5th day ... | 76     | 82      | 72       | 84     | 81     | 82     | 73     | 73      | 77.87                |
| 6th day ... | 76     | 74      | 77       | 87     | 73     | 76     | 72     | 78      | 76.0                 |
| 7th day ... | 72     | 78      | 70       | 90     | 74     | 75     | 90     | 69      | 77.2                 |
| 8th day ... | 76     | 79      | 73       | 83     | 78     | 84     | 70     | 72      | 76.87                |
| 9th day ... | 67     | 78      | 75       | 77     | 75     | 76     | 73     | 73      | 74.2                 |
| 10th day... | 73     | 80      | 77       | 79     | 74     | 76     | 78     | 67      | 75.5                 |
| Mean .....  | 71.7   | 78.4    | 74.2     | 83.7   | 75.8   | 78.8   | 76.6   | 71.3    | 76.3                 |

The pulse in this man had a daily course of great uniformity, the changes being chiefly dependent on food and in a less degree on exercise. If the last line (the mean of the hours) is read, and it is remembered that breakfast was taken at 8, dinner at 1, and tea at 5, the increase in the number of beats at 10, 2, and 6 o'clock is at once accounted for. It rose after breakfast nearly 7 beats; then fell 4 beats; rose after dinner nearly 10 beats; then fell, but not to its previous standard; rose after tea 3 beats, and then fell, till at 10 P.M. it was nearly the same as at 8 A.M. The



other cause influencing the heart's beats was exercise; we kept the exercise as uniform as we could, but there were variations, and we could often trace defect or excess of exercise on the next reading of the pulse. The daily mean of the pulse was fairly uniform, the mean of the 10 days being 76.3 beats per minute, the extreme mean daily variation was from 74.2 to 77.87.

*Pulse during wine; 10 ounces at 1 o'clock during the first 5 days, and 20 ounces during the last 5.*

| Days.       | Hours. |         |          |        |        |        |        |         | Mean of the days. |
|-------------|--------|---------|----------|--------|--------|--------|--------|---------|-------------------|
|             | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. | 10 P.M. |                   |
| 11th day... | 67     | 79      | 76       | 79     | 80     | 87     | 80     | 72      | 77.5              |
| 12th day... | 72     | 71      | 72       | 85     | 82     | 90     | 95     | 82      | 81.1              |
| 13th day... | 76     | 73      | 70       | 86     | 84     | 89     | 80     | 73      | 78.8              |
| 14th day... | 67     | 82      | 83       | 92     | 87     | 89     | 76     | 78      | 81.7              |
| 15th day... | 70     | 81      | 77       | 92     | 88     | 93     | 84     | 76      | 82.6              |
| 16th day... | 77     | 80      | 75       | 76     | 94     | 86     | 87     | 76      | 81.3              |
| 17th day... | 74     | 82      | 75       | 93     | 88     | 86     | 80     | 74      | 81.5              |
| 18th day... | 76     | 75      | 75       | 94     | 88     | 91     | 78     | 69      | 80.7              |
| 19th day... | 76     | 82      | 69       | 86     | 96     | 89     | 82     | 78      | 82.2              |
| 20th day... | 68     | 86      | 67       | 85     | 89     | 81     | 79     | 71      | 78.2              |
| Means.....  | 72.3   | 79.1    | 73.9     | 86.8   | 87.6   | 88.1   | 82.1   | 74.9    | 80.5              |

The wine increased the frequency of the heart's action by  $4\frac{1}{4}$  beats every minute during 14 hours in the day, and doubtless also in the remaining 10, for the pulse at 8 A.M. was still too frequent during the wine period. In the 24 hours there was then an excess in the heart's action of 6120 beats, or nearly 6 per cent. As the amount of alcohol was 1.1 ounces in the first 5 days, and 2.2 ounces in the other 5, the increase in the number of the heart's beats was slightly more than in the days when an equal quantity of pure alcohol was taken.

This was partly owing to the continuance of the wine, as the first day's excess was only 1658 beats, and partly to the fact that whereas in the former series of experiments the mean pulse-beats in the water period were 73, in this they were 76.3. The man's heart was evidently rather more excitable in this series than in the former.

When the hourly changes are compared with the water period, it is seen that the influence of food is marked as before, but that the wine exaggerated the effect, and kept the pulse at a greater rate for a longer time.

An extract from the Tables will show this. It must be noted that the wine was taken at 1 o'clock, or a little after.

|   | Water period. | Wine period. |
|---|---------------|--------------|
| Mean number of pulse at 10 A.M. after breakfast.. | 78.4          | 79.1         |
| Mean at 2 P.M. after dinner .....                 | 83.7          | 86.8         |
| Mean at 4 P.M. ....                               | 75.8          | 87.6         |
| Mean at 6 P.M. after tea .....                    | 78.8          | 88.1         |
| Mean at 8 P.M. ....                               | 76.6          | 82.1         |
| Mean at 10 P.M. ....                              | 71.3          | 74.9         |



It will be seen, then, that the pulse at 4, 6, and 8 o'clock in the wine period is much above the corresponding numbers in the water period. The effect of the wine is largely perceptible for eight hours, and is traceable during all the observations. The mean of the first five days is 80·34 beats per minute, and of the last five days 80·78 beats.

The effect of increasing the wine to 20 ounces is chiefly perceived in the greater acceleration of the pulse at 4 o'clock in the last five days as compared with the first five. When 10 ounces were taken, the mean pulse at 4 o'clock was 84·2, or two beats per minute less than at 2 o'clock, whereas in the 20-ounce days the mean pulse at 4 o'clock was four beats above the 2 o'clock rate.

*Pulse after wine.*

| Days.        | Hours. |         |          |        |        |        |        |         | Mean of the days. |
|--------------|--------|---------|----------|--------|--------|--------|--------|---------|-------------------|
|              | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. | 10 P.M. |                   |
| 21st day ... | 68     | 86      | 74       | 96     | 84     | 90     | 70     | 69      | 79·6              |
| 22nd day ... | 78     | 84      | 72       | 80     | 78     | 83     | 81     | 69      | 78·1              |
| 23rd day ... | 72     | 80      | 74       | 84     | 84     | 78     | 81     | 72      | 78·1              |
| 24th day ... | 73     | 79      | 76       | 83     | 79     | 84     | 82     | 74      | 78·75             |
| 25th day ... | 70     | 77      | 73       | 77     | 74     | 82     | 81     | 78      | 76·5              |
| 26th day ... | 69     | 84      | 77       | 82     | 78     | 84     | 77     | 65      | 77                |
| 27th day ... | 70     | 75      | 95       | 99     | 89     | 92     | 92     | 80      | 84·5              |
| 28th day ... | 70     | 79      | 87       | 86     | 84     | 86     | 84     | 84      | 82·5              |
| 29th day ... | 74     | 82      | 74       | 84     | 84     | 80     | 83     | 79      | 80                |
| 30th day ... | 70     | 80      | 70       | 96     | 89     | 79     | 74     | 72      | 78·75             |
| Means.....   | 71·4   | 80·6    | 77·2     | 86·7   | 82·3   | 83·8   | 80·5   | 74·2    | 79·38             |

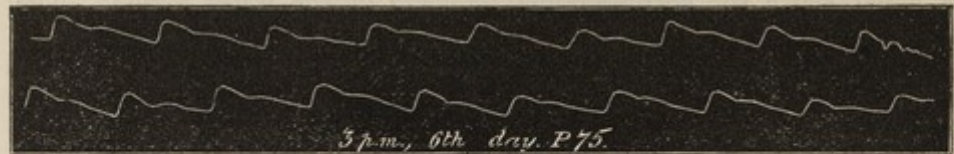
The pulse continued high during the whole of this period, the excess being chiefly in the afternoon hours; even 10 days after the wine was left off it had not returned to its proper rate; but this was probably in part owing to indisposition, which will be referred to presently.

Sphygmographic observations were taken three times a day; but as the curves from alcohol were so fully given in the former paper, we have thought it necessary only to put in nine curves, three before, four during, and two after wine. We have selected 3 o'clock as the hour, so that the influence of food is perceptible in all: the effect of the wine was the same as that of alcohol, though of course in a degree proportional to the amount.

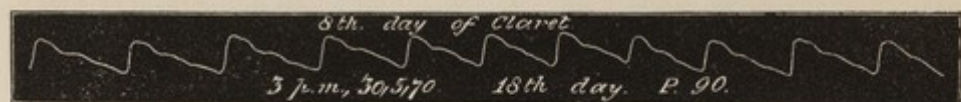
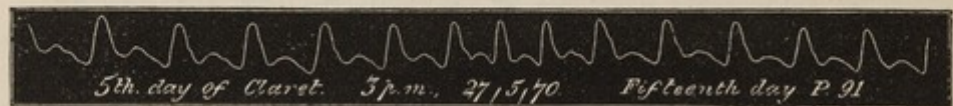
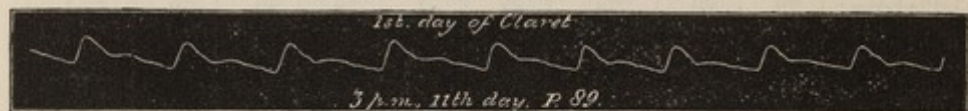
We also attempted to determine the ratio of the radial pulse, heart's action, and respiration by means of Dr. Burdon-Sanderson's ingenious cardiograph. Unfortunately we did not obtain the instrument in time to determine the curves properly in the period before wine, and we are therefore not able to give proper comparisons. We could not, however, so far trace any effect on the number or depth of the respirations.



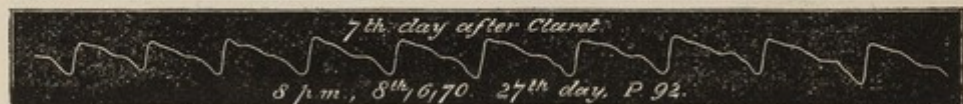
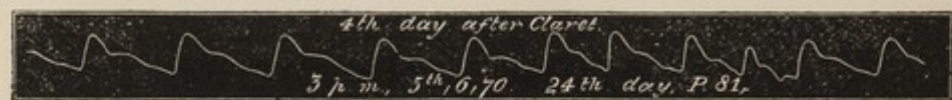
Before claret.—At 3 p.m., 2 hours after dinner.



During claret.—2 hours after dinner.



After claret.—2 hours after dinner.



### 3. THE TEMPERATURE OF THE BODY

The temperature was taken both in the axilla and rectum, in order to obtain a control of the observations. The degrees are Fahrenheit.



## (a) In the Axilla.

The thermometer was kept in the axilla for 20 minutes or more, while the man was in bed and covered with the clothes.

*First Period. Temperature of axilla before wine.*

| Days.       | Hours. |        |         |          |        |        |        |        |         | Mean of the days. |
|-------------|--------|--------|---------|----------|--------|--------|--------|--------|---------|-------------------|
|             | 6 A.M. | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. | 10 P.M. |                   |
| 1st day ... | 97.8   | 98.0   | 98.0    | 98.0     | 98.4   | 98.4   | 98.4   | 98.2   | 98.4    | 98.17             |
| 2nd day ... | 97.4   | 97.4   | 98.0    | 97.6     | 98.4   | 97.8   | 98.0   | 98.8   | 98.0    | 97.93             |
| 3rd day ... | 97.8   | 97.0   | 97.4    | 97.4     | 98.2   | 98.0   | 97.2   | 98.6   | 98.4    | 97.77             |
| 4th day ... | 97.2   | 97.0   | 98.4    | 97.3     | 97.4   | 97.4   | 97.8   | 98.0   | 97.6    | 97.56             |
| 5th day ... | 97.8   | 97.4   | 97.2    | 97.0     | 97.6   | 97.6   | 98.0   | 98.0   | 97.6    | 97.57             |
| 6th day ... | 97.6   | 97.4   | 97.6    | 97.8     | 97.6   | 97.8   | 97.6   | 97.6   | 97.2    | 97.57             |
| 7th day ... | 97.6   | 97.8   | 97.4    | 97.0     | 98.0   | 97.6   | 97.8   | 97.6   | 97.4    | 97.57             |
| 8th day ... | 97.8   | 97.6   | 97.2    | 97.8     | 97.8   | 97.4   | 97.6   | 98.0   | 97.4    | 97.62             |
| 9th day ... | 97.4   | 97.2   | 98.2    | 97.6     | 98.2   | 97.6   | 98.0   | 97.4   | 98.0    | 97.73             |
| 10th day... | 97.0   | 97.4   | 98.0    | 98.0     | 98.2   | 97.4   | 97.8   | 98.8   | 97.4    | 97.77             |
| Means.....  | 97.54  | 97.42  | 97.74   | 97.55    | 97.98  | 97.70  | 97.82  | 98.10  | 97.74   | 97.726            |

It will be seen on reading the last line (mean of the hours) that the temperature follows the same course as the pulse in being manifestly influenced by food, and rising after breakfast, dinner, and tea. The only exception (and this is perhaps apparent only) is at 8 P.M., when the mean temperature is higher than at 6 P.M. while the pulse is falling; but this was perhaps accidental, *i. e.* a longer series of observations might have given different results; for in three observations the temperature was higher at 6 o'clock, and in three it was equal, while in the other four, when it was highest at 8 o'clock, there were two exceptional high temperatures which augmented the mean amount. In the next period the mean temperature at 8 P.M. was lower than at 6.

We were unable to see any diurnal change of temperature in this man apart from food; there was no afternoon or evening rise of temperature, dependent solely on the time of day.

The temperature was more uniform than in the experiments in February,

*Second Period. Temperature of axilla during wine.*

| Days.       | Hours. |        |         |          |        |        |        |           |         | Mean of the days. |
|-------------|--------|--------|---------|----------|--------|--------|--------|-----------|---------|-------------------|
|             | 6 A.M. | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M.    | 10 P.M. |                   |
| 11th day... | 97.0   | 97.2   | 97.6    | 97.8     | 98.0   | 97.6   | 97.6   | 97.8      | 97.4    | 97.55             |
| 12th day... | 97.2   | 97.4   | 97.0    | 97.4     | 97.0   | 97.2   | 98.0   | 97.6      | 97.4    | 97.35             |
| 13th day... | 97.0   | 97.2   | 97.6    | 97.6     | 98.0   | 97.4   | 98.2   | 97.4      | 97.0    | 97.48             |
| 14th day... | 96.8   | 97.0   | 97.8    | 97.2     | 98.0   | 97.8   | 98.4   | 98.0      | 97.6    | 97.4              |
| 15th day... | 97.4   | 97.6   | 98.0    | 97.4     | 98.2   | 98.2   | 98.0   | 98.2      | 97.8    | 97.85             |
| 16th day... | 97.4   | 97.8   | 97.4    | 98.0     | 97.8   | 98.0   | 98.0   | 97.6      | 97.6    | 97.73             |
| 17th day... | 96.8   | 97.0   | 97.4    | 97.4     | 98.0   | 97.8   | 97.4   | 97.0      | 97.0    | 97.31             |
| 18th day... | 97.2   | 97.2   | 97.6    | 98.0     | 97.8   | 97.6   | 97.4   | not taken |         | 97.54             |
| 19th day... | 97.6   | 98.0   | 97.4    | 97.4     | 98.2   | 97.8   | 98.0   | 97.8      | 98.0    | 97.8              |
| 20th day... | 96.8   | 97.0   | 98.0    | 97.8     | 98.0   | 97.4   | 97.8   | 97.6      | 97.8    | 97.59             |
| Means.....  | 97.12  | 97.3   | 97.58   | 97.60    | 97.90  | 97.68  | 97.88  | 97.66     | 97.50   | 97.56             |



If the mean temperature at 2, 4, 6, and 8 o'clock, when the wine was acting most on the pulse, are placed side by side, we have,—

| Hours.      | Temperature.  |              |
|-------------|---------------|--------------|
|             | Water period. | Wine period. |
| 2 P.M. .... | 97.98         | 97.90        |
| 4 P.M. .... | 97.70         | 97.68        |
| 6 P.M. .... | 97.82         | 97.88        |
| 8 P.M. .... | 98.10         | 97.66        |

The temperatures of the three first hours are practically identical, and as already said, the rise at 8 o'clock in the water period seems to us accidental, *i. e.* as dependent on two exceptional high temperatures, which raised the mean amount. In the other 5 hours the mean temperature was four times slightly higher in the water, and once in the wine period.

The result of all the observations was that, in the water period of ten days, the mean temperature was  $97^{\circ}.726$ , and in the wine period was  $97^{\circ}.56$ , or  $0^{\circ}.166$  less, a difference so slight as probably to fall within the limits of unavoidable error. The mean of the first five days, with 10 ounces of wine, was  $97^{\circ}.526$ ; the mean of the last five days, with 20 ounces of wine, was  $97^{\circ}.590$ , proving that doubling the amount of wine caused no lowering of mean temperature, and probably no rise, as the difference is so slight.

We conclude that in health the apparent heat after wine must be owing, as in the case of alcohol and brandy, rather to subjective feelings connected with the quickened circulation than with an actual rise of temperature; but that, on the other hand, wine in the above quantities causes no appreciable lowering of temperature.

*Third Period. Temperature of Axilla after wine.*

| Days.        | Hours. |        |         |          |        |        |        |        |         | Mean of the days. |
|--------------|--------|--------|---------|----------|--------|--------|--------|--------|---------|-------------------|
|              | 6 A.M. | 8 A.M. | 10 A.M. | 12 noon. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. | 10 P.M. |                   |
| 21st day ... | 97.2   | 97.4   | 98.0    | 98.3     | 99.2   | 98.4   | 98.6   | 97.6   | 97.6    | 98                |
| 22nd day ..  | 97.4   | 97.4   | 98.2    | 97.8     | 98.2   | 97.8   | 98.0   | 97.4   | 97.0    | 97.6              |
| 23rd day...  | 97.6   | 97.6   | 98.0    | 98.0     | 98.4   | 98.0   | 97.8   | 98.0   | 98.2    | 97.9              |
| 24th day...  | 97.2   | 97.4   | 97.6    | 97.6     | 98.2   | 97.6   | 98.0   | 97.6   | 97.0    | 97.5              |
| 25th day...  | 97.8   | 98.0   | 97.8    | 98.4     | 99.2   | 98.0   | 98.2   | 97.6   | 97.2    | 98.0              |
| 26th day...  | 97.0   | 97.0   | 98.2    | 98.4     | 98.8   | 97.6   | 97.8   | 97.8   | 97.4    | 97.7              |
| 27th day...  | 97.0   | 96.8   | 97.8    | 98.4     | 99.8   | 98.6   | 98.0   | 97.6   | 97.0    | 97.8              |
| 28th day...  | 97.0   | 97.0   | 97.4    | 98.0     | 98.6   | 98.2   | 98.0   | 97.8   | 97.6    | 97.7              |
| 29th day...  | 97.2   | 97.0   | 97.6    | 97.6     | 98.0   | 97.6   | 98.0   | 98.4   | 98.2    | 97.7              |
| 30th day...  | 97.4   | 97.6   | 98.0    | 97.4     | 98.2   | 97.8   | 98.0   | 97.8   | 97.6    | 97.8              |
| Means.....   | 97.28  | 97.32  | 97.86   | 97.99    | 98.66  | 97.96  | 98.04  | 97.76  | 97.48   | 97.86             |

In this period the diurnal variations were almost identical with the others, and the mean temperature of the whole period was practically the same as that of the first ten days.



## (b) In the Rectum.

*Rectum before wine (thermometer inserted for about 3 inches, and kept in for 20 minutes).*

| Days.       | Hours. |          |        |         | Mean of the days. |
|-------------|--------|----------|--------|---------|-------------------|
|             | 8 A.M. | 12 noon. | 4 P.M. | 10 P.M. |                   |
| 1st day ... | 99     | 99.6     | 99.95  | 99.8    | 99.27             |
| 2nd day ... | 99.2   | 99.2     | 99.4   | 99.2    | 99.25             |
| 3rd day ... | 99.8   | 99       | 99.2   | 99.5    | 99.37             |
| 4th day ... | 99.8   | 99.4     | 99.4   | 99.6    | 99.55             |
| 5th day ... | 99.4   | 99.6     | 99.2   | 99      | 99.3              |
| 6th day ... | 99.2   | 99.8     | 99.6   | 99.6    | 99.55             |
| 7th day ... | 99.6   | 99.6     | 99.2   | 99.4    | 99.45             |
| 8th day ... | 99.4   | 99.6     | 99.4   | 99.2    | 99.4              |
| 9th day ... | 99     | 99.4     | 98.6   | 99.0    | 99                |
| 10th day... | 98.6   | 99.8     | 99.4   | 99.8    | 99.65             |
| Means ...   | 99.2   | 99.50    | 99.29  | 99.41   | 99.38             |

The mean temperature of the rectum (taken four times a day instead of three, as in the former experiments, and at different hours) was rather higher than the mean of the former experiments, viz. as 99.38 to 99.066. It was also more uniform, both from day to day and hour to hour. If these four hours be accepted as giving the mean temperature of the 24 hours, the rectum temperature was  $1^{\circ}.654$  above that in the axilla.

*Rectum during wine.*

| Days.       | Hours. |          |        |         | Mean of the days. |
|-------------|--------|----------|--------|---------|-------------------|
|             | 8 A.M. | 12 noon. | 4 P.M. | 10 P.M. |                   |
| 11th day..  | 98.6   | 99.9     | 99.2   | 99.6    | 99.37             |
| 12th day... | 98.4   | 99.4     | 99.6   | 99.2    | 99.15             |
| 13th day... | 98.6   | 99.4     | 99.8   | 99      | 99.2              |
| 14th day... | 98.8   | 99.8     | 99.2   | 99      | 99.2              |
| 15th day... | 99.4   | 99.6     | 99     | 99      | 99.25             |
| 16th day... | 99.8   | 99.4     | 99.6   | 99.4    | 99.55             |
| 17th day... | 98.6   | 99.6     | 99.8   | 99      | 99.25             |
| 18th day... | 98.8   | 99.6     | 99.2   | 98      | 98.9              |
| 19th day... | 98.6   | 99.5     | 99     | 98.4    | 98.87             |
| 20th day... | 99     | 99.8     | 99.4   | 99.8    | 99.5              |
| Means ...   | 98.86  | 99.60    | 99.38  | 99.04   | 99.22             |

The mean temperature is  $0^{\circ}.16$  lower. It is curious that this is almost precisely the same change as in the case of the axillary temperature; yet it is probably an accidental coincidence. The 4 P.M. temperature, which ought to show the effect of wine, is slightly higher ( $0^{\circ}.09$ ) than in the first period; the 10 P.M. and 8 A.M. temperatures are lower by nearly  $0^{\circ}.3$ , and the 12 o'clock temperature is higher by  $0^{\circ}.1$ .

The differences are thus slight, and in contrary directions, so that no decided influence, one way or the other, can, we think, be ascribed to the wine.



*Rectum after wine.*

| Days.        | Hours. |          |        |         | Mean of the days. |
|--------------|--------|----------|--------|---------|-------------------|
|              | 8 A.M. | 12 noon. | 4 P.M. | 10 P.M. |                   |
| 21st day ... | 99.8   | 99.9     | 99.4   | 99.2    | 99.57             |
| 22nd day ..  | 99.0   | 99.6     | 99.8   | 99.0    | 99.35             |
| 23rd day...  | 99.0   | 99.5     | 99.2   | 99.6    | 99.32             |
| 24th day...  | 99.2   | 99.4     | 99.2   | 99.0    | 99.2              |
| 25th day...  | 99.6   | 99.4     | 99.4   | 99.2    | 99.4              |
| 26th day...  | 98.8   | 99.2     | 99.4   | 99.0    | 99.1              |
| 27th day...  | 98.8   | 99.2     | 99.2   | 99.4    | 99.15             |
| 28th day...  | 99.0   | 99.4     | 99.6   | 99.4    | 99.35             |
| 29th day...  | 99.6   | 99.2     | 99.0   | 99.6    | 99.35             |
| 30th day...  | 98.8   | 99.8     | 99.6   | 99.4    | 99.4              |
| Means.....   | 99.16  | 99.46    | 99.38  | 99.28   | 99.32             |

The temperatures are almost precisely the same as in the first period. The 4 o'clock temperature is identical with that of the wine-period.

## 4. ACTION ON THE URINE.

*Elimination of water by the kidneys.*

Twenty-eight fluid ounces were taken as drink, and the water in the so-called solid food made the total daily ingress of water  $72\frac{1}{2}$  fluid ounces, or 2059 cub. centims.

The following are the means of the three periods:—

|                          | Amount of water taken daily in solid food and as drink. | Mean amount of urine passed in 24 hours. |
|--------------------------|---|--|
| 1st period (water) ..... | 2059 c. c.  | 1210 c. c.                               |
| 2nd period (wine) .....  | 2010 c. c.  | 1148 c. c.                               |
| 3rd period (water).....  | 2059 c. c.  | 1155 c. c.                               |

As 49 cub. centims. less water were taken in the wine-period, the amount of urine ought perhaps to be increased by this amount, and this would make it only 13 cub. centims. less than the first period,

It may be concluded that 10 and 20 ounces of light wine (containing 1.1 and 2.2 ounces of alcohol), when substituted for water, had no diuretic effect. The amount of alcohol to act as a diuretic was perhaps too small, as in the former series with the larger quantities of alcohol there was certainly some increased flow of urinary water.

*Elimination of nitrogen by the kidneys.*

The same amount of food being given as in the previous experiments, the amount of nitrogen passing into the body was  $17\frac{1}{4}$  or  $17\frac{1}{2}$  grammes, or probably a little more. The whole of this passed by the urine and bowels, so that in this respect the difference in the temperature of the air had no effect. In other words, although the weather was so hot, there was no evidence of urea escaping by the skin.



The substances precipitated by Liebig's mercuric nitrate were as usual termed urea, and the nitrogen was calculated from this. It was also for the sake of control determined by soda-lime.

*Nitrogen before claret.*

| Days.          | Urea.    | Nitrogen<br>calculated from<br>urea. | Nitrogen<br>by<br>soda-lime. |
|----------------|----------|--------------------------------------|------------------------------|
|                | grammes. | grammes.                             | grammes.                     |
| 1st day .....  | 30.299   | 14.139                               | 14.211                       |
| 2nd day .....  | 33.343   | 15.560                               | 16.555                       |
| 3rd day .....  | 31.094   | 14.487                               | 14.917                       |
| 4th day .....  | 34.960   | 16.315                               | 16.933                       |
| 5th day .....  | 31.038   | 14.484                               | 15.323                       |
| 6th day .....  | 40.200   | 18.760                               | 18.639                       |
| 7th day .....  | 37.800   | 16.640                               | 17.469                       |
| 8th day .....  | 39.633   | 18.495                               | 18.024                       |
| 9th day .....  | 37.050   | 17.290                               | 16.779                       |
| 10th day ..... | 39.940   | 18.635                               |                              |
| Means .....    | 35.535   | 16.680                               | 16.539                       |

The mean of the nine days of ureal nitrogen, which correspond with the days of soda-lime nitrogen, is 16.493 grammes. The mean of the ten first days in the previous series, with an equal quantity of food, was 16.211 grammes of nitrogen as calculated from the urea, and 16.226 grammes as determined by soda-lime. In the present experiments the amounts are higher in a very trifling degree, viz. .379 gramme, and .313 gramme in excess respectively. The difference is so slight (under 6 grains in 24 hours) that the two series may be considered identical. Possibly as the man was 4 lbs. heavier, there might be some additional nitrogenous tissue furnishing the slight excess of nitrogen.

*Nitrogen during claret.*

| Days.          | Urea.    | Nitrogen<br>calculated from<br>urea. | Nitrogen<br>by<br>soda-lime. |
|----------------|----------|--------------------------------------|------------------------------|
|                | grammes. | grammes.                             | grammes.                     |
| 11th day ..... | 37.137   | 17.331                               |                              |
| 12th day ..... | 35.325   | 16.485                               | 16.839                       |
| 13th day ..... | 38.356   | 17.899                               | 18.825                       |
| 14th day ..... | 34.860   | 16.268                               | 16.074                       |
| 15th day ..... | 35.040   | 16.352                               | 17.255                       |
| 16th day ..... | 37.570   | 17.532                               | 16.707                       |
| 17th day ..... | 41.745   | 19.486                               | 18.886                       |
| 18th day ..... | 35.048   | 16.355                               | 15.764                       |
| 19th day ..... | 34.650   | 16.170                               | 15.443                       |
| 20th day ..... | 31.510   | 14.701                               | 14.600                       |
| Means .....    | 36.124   | 16.858                               | 16.421                       |

The variations from the period before claret are so slight, and indeed



insignificant, as to prove that 10 and 20 fluid ounces of claret, taken for two periods of five days, caused no alteration in the elimination of nitrogen, when the egress of nitrogen was constant.

Thus to express the result in grains, the daily nitrogen calculated from the urea was, in the first period of ten days, 257·37 grains, and in the second or wine-period 260 grains. In nine days of the two periods, the daily nitrogen by soda-lime was 255·19 grains in the water-, and 253·35 grains in the wine-period.

*Nitrogen after claret.*

| Days.          | Urea.    | Nitrogen<br>calculated from<br>urea. | Nitrogen<br>by<br>soda-lime. |
|----------------|----------|--------------------------------------|------------------------------|
|                | grammes. | grammes.                             | grammes.                     |
| 21st day ..... | 45·500   | 21·233                               | 20·779                       |
| 22nd day ..... | 42·900   | 20·020                               |                              |
| 23rd day ..... | 38·112   | 17·780                               | 18·159                       |
| 24th day ..... | 36·960   | 17·448                               | 17·640                       |
| 25th day ..... | .....    | .....                                | 14·119                       |
| 26th day ..... | 42·900   | 20·020                               |                              |
| 27th day ..... | 41·128   | 21·193                               |                              |
| 28th day ..... | 44·646   | 20·805                               | 20·110                       |
| 29th day ..... | 38·739   | 18·078                               | 18·548                       |
| 30th day ..... | 27·777   | 12·938                               | 13·324                       |
| Means .....    | 39·851   | 18·883                               | 17·525                       |

As one determination of urea and three determinations of nitrogen by soda-lime were lost, in order to find the daily amount of nitrogen in the whole of the ten days, the soda-lime nitrogen of the 25th day may be added to the total ureal nitrogen, and the mean taken. If this be done, the mean daily excretion of nitrogen was 18·362 grammes. This gives an excess of no less than 1·682 gramme over the first period, and 1·504 over the wine-period. The excess was so large, and was so unlike anything seen before during any of the experiments, as to prove it was not accidental.

The question now arises, if the increase was owing to the direct effect of the wine. This seems unlikely, partly because some evidence of increase would then have been obtained from the ten days during which the wine was taken, and partly from another reason. During this last period the man became ill; he was not feverish, but his pulse was quick. On the 25th, 26th, and 27th days there was some looseness of the bowels and headache; he could scarcely eat his food, and lost weight for the first time.

On the 29th day he was better, and on the 30th felt quite well, and on that day the nitrogen (as determined in both ways) fell greatly. He ascribed his illness to the monotony of his life, the sameness of his diet, and the comparative want of exercise, whilst it is also possible that the



## ERRATUM.

Page 84, line 3 from top—for “when the egress of nitrogen was constant”  
read “when the ingress of nitrogen was constant”.

tion was most active. The gradual loss of weight of the body was very striking.

*The phosphoric acid, chlorine, and free acidity in the urine.*

| Days.          | Phosphoric acid. | Chlorine. | Free acidity calculated as crystallized oxalic acid. |
|----------------|------------------|-----------|--|
|                | grammes.         | grammes.  | grammes.   |
| 1st day .....  | 1·886            | 7·295     |  |
| 2nd day .....  | 2·081            | 8·571     |  |
| 3rd day .....  | 2·338            | 9·045     |  |
| 4th day .....  | 2·348            | 9·242     | 1·865  |
| 5th day .....  | 2·327            | 7·011     | 1·415  |
| 6th day .....  | 2·460            | 8·307     | 2·192  |
| 7th day .....  | 2·328            | 6·134     | 1·890  |
| 8th day .....  | 2·582            | 6·688     | 1·891  |
| 9th day .....  | 2·340            | 7·799     | 2·538  |
| 10th day ..... | 2·272            | 7·072     | 1·892  |
| 11th day ..... | 2·132            | 6·467     | 1·828  |
| 12th day ..... | 2·234            | 6·399     | 1·885  |
| 13th day ..... | 2·352            | 5·524     | 1·756  |
| 14th day ..... | 2·450            | 6·658     | 1·940  |
| 15th day ..... | 2·333            | 5·403     | 1·486  |
| 16th day ..... | 2·442            | 5·793     | 2·709  |
| 17th day ..... | 2·577            | 5·999     | 2·972  |
| 18th day ..... | 2·132            | 6·498     | 2·948  |
| 19th day ..... | 1·942            | 7·045     | 2·182  |
| 20th day ..... | 1·881            | 6·235     | 2·503  |
| 21st day ..... | 2·678            | 6·276     | 2·784  |
| 22nd day ..... | 2·405            | 7·422     | 2·457  |
| 23rd day ..... | 2·265            | 6·543     | 2·782  |
| 24th day ..... | 2·453            | 7·494     | 2·469  |
| 25th day ..... | 2·138            | 7·713     | 2·013  |
| 26th day ..... | 2·286            | 10·763    | 1·968  |
| 27th day ..... | 2·798            | 7·074     | 3·339  |
| 28th day ..... | 3·040            | 7·025     | 2·745  |
| 29th day ..... | 2·722            | 6·170     | 2·308  |
| 30th day ..... | 1·182            | 5·286     | 1·489  |

The mean quantities are as follows:—

|                                   | Phosphoric acid. | Chlorine. | Free acidity. |
|-----------------------------------|------------------|-----------|---------------|
| First period (before wine).....   | 2·296            | 7·708     | 1·955         |
| Second period (during wine) ..... | 2·247            | 6·202     | 2·221         |
| Third period (after wine).....    | 2·396            | 7·176     | 2·435         |

Red Bordeaux wine, in quantities of 10 and 20 ounces per diem, did not



ERRATUM.

Page 84 , line 3 from top—*for* “ when the egress of nitrogen was constant ”  
*read* “ when the ingress of nitrogen was constant ”.



grains in the wine-period.

*Nitrogen after claret.*

| Days.          | Urea.    | Nitrogen<br>calculated from<br>urea. | Nitrogen<br>by<br>soda-lime. |
|----------------|----------|--------------------------------------|------------------------------|
|                | grammes. | grammes.                             | grammes.                     |
| 21st day ..... | 45.500   | 21.233                               | 20.779                       |
| 22nd day ..... | 42.900   | 20.020                               |                              |
| 23rd day ..... | 38.112   | 17.780                               | 18.159                       |
| 24th day ..... | 36.960   | 17.448                               | 17.640                       |
| 25th day ..... |          |                                      | 14.119                       |
| 26th day ..... | 42.900   | 20.020                               |                              |
| 27th day ..... | 41.128   | 21.193                               |                              |
| 28th day ..... | 44.646   | 20.805                               | 20.110                       |
| 29th day ..... | 38.739   | 18.078                               | 18.548                       |
| 30th day ..... | 27.777   | 12.938                               | 13.324                       |
| Means .....    | 39.851   | 18.883                               | 17.525                       |

As one determination of urea and three determinations of nitrogen by soda-lime were lost, in order to find the daily amount of nitrogen in the whole of the ten days, the soda-lime nitrogen of the 25th day may be added to the total ureal nitrogen, and the mean taken. If this be done, the mean daily excretion of nitrogen was 18.362 grammes. This gives an excess of no less than 1.682 gramme over the first period, and 1.504 over the wine-period. The excess was so large, and was so unlike anything seen before during any of the experiments, as to prove it was not accidental.

The question now arises, if the increase was owing to the direct effect of the wine. This seems unlikely, partly because some evidence of increase would then have been obtained from the ten days during which the wine was taken, and partly from another reason. During this last period the man became ill; he was not feverish, but his pulse was quick. On the 25th, 26th, and 27th days there was some looseness of the bowels and headache; he could scarcely eat his food, and lost weight for the first time.

On the 29th day he was better, and on the 30th felt quite well, and on that day the nitrogen (as determined in both ways) fell greatly. He ascribed his illness to the monotony of his life, the sameness of his diet, and the comparative want of exercise, whilst it is also possible that the



wine, to which he was unaccustomed, and the small allowance of water, may have had some effect in deranging his nutrition. It seems, however, fair to conclude that the wine had only an indirect share, if any, in causing this illness and increased elimination, which was manifestly caused by some peculiar morbid state of nutrition. It is noticeable in this case that there was increased elimination of nitrogen (evidently in the form of urea), without any increase in the mean temperature of the body. There was, however, an increase in the temperature at 2, 4, and 6 o'clock, when digestion was most active. The gradual loss of weight of the body was very striking.

*The phosphoric acid, chlorine, and free acidity in the urine.*

| Days.          | Phosphoric acid. | Chlorine. | Free acidity calculated as crystallized oxalic acid. |
|----------------|------------------|-----------|--|
|                | grammes.         | grammes.  | grammes.   |
| 1st day .....  | 1.886            | 7.295     |  |
| 2nd day .....  | 2.081            | 8.571     |  |
| 3rd day .....  | 2.338            | 9.045     |  |
| 4th day .....  | 2.348            | 9.242     | 1.865  |
| 5th day .....  | 2.327            | 7.011     | 1.415  |
| 6th day .....  | 2.460            | 8.307     | 2.192  |
| 7th day .....  | 2.328            | 6.134     | 1.890  |
| 8th day .....  | 2.582            | 6.688     | 1.891  |
| 9th day .....  | 2.340            | 7.799     | 2.538  |
| 10th day ..... | 2.272            | 7.072     | 1.892  |
| 11th day ..... | 2.132            | 6.467     | 1.828  |
| 12th day ..... | 2.234            | 6.399     | 1.885  |
| 13th day ..... | 2.352            | 5.524     | 1.756  |
| 14th day ..... | 2.450            | 6.658     | 1.940  |
| 15th day ..... | 2.333            | 5.403     | 1.486  |
| 16th day ..... | 2.442            | 5.793     | 2.709  |
| 17th day ..... | 2.577            | 5.999     | 2.972  |
| 18th day ..... | 2.132            | 6.498     | 2.948  |
| 19th day ..... | 1.942            | 7.045     | 2.182  |
| 20th day ..... | 1.881            | 6.235     | 2.503  |
| 21st day ..... | 2.678            | 6.276     | 2.784  |
| 22nd day ..... | 2.405            | 7.422     | 2.457  |
| 23rd day ..... | 2.265            | 6.543     | 2.782  |
| 24th day ..... | 2.453            | 7.494     | 2.469  |
| 25th day ..... | 2.138            | 7.713     | 2.013  |
| 26th day ..... | 2.286            | 10.763    | 1.968  |
| 27th day ..... | 2.798            | 7.074     | 3.339  |
| 28th day ..... | 3.040            | 7.025     | 2.745  |
| 29th day ..... | 2.722            | 6.170     | 2.308  |
| 30th day ..... | 1.182            | 5.286     | 1.489  |

The mean quantities are as follows :—

|                                   | Phosphoric acid. | Chlorine. | Free acidity. |
|-----------------------------------|------------------|-----------|---------------|
| First period (before wine).....   | 2.296            | 7.708     | 1.955         |
| Second period (during wine) ..... | 2.247            | 6.202     | 2.221         |
| Third period (after wine).....    | 2.396            | 7.176     | 2.435         |

Red Bordeaux wine, in quantities of 10 and 20 ounces per diem, did not



affect the excretion of phosphoric acid. The effect on the chlorine is uncertain, as that ingredient has such a wide range of variation. It is, however, interesting to note that the mean daily excretion of the whole thirty days is almost precisely the same as the mean daily excretion of the twenty-five days in the previous series (viz. 7.028 grammes as against 6.915 grammes), and this proves the equality of the diet.

The acidity of the urine was increased during the wine-period, and this continued afterwards. It may be observed that the mean free acidity of the former experiments was almost precisely the same as in these experiments during the water-period (viz. 1.974 as against 1.955 gramme), and was very nearly the same in the alcoholic as in the wine-period (viz. 2.342 as against 2.221).

It seems fair to conclude that the free acidity was really increased, and that the increase continued subsequently.

##### 5. THE ALVINE DISCHARGES.

###### *Weight of Stools.*

| Days. | Ounces. | Grammes. | Days. | Ounces. | Grammes. | Days. | Ounces. | Grammes. |
|-------|---------|----------|-------|---------|----------|-------|---------|----------|
| 1.    | 4.5     |          | 11.   | 4.25    |          | 21.   | 3.3     |          |
| 2.    | 6       |          | 12.   | .....   |          | 22.   |         |          |
| 3.    | .....   |          | 13.   | 5.75    |          | 23.   | 8.33    |          |
| 4.    | 7.25    |          | 14.   | 8.1     |          | 24.   |         |          |
| 5.    | 4       |          | 15.   | 4       |          | 25.   | 6.75    |          |
| 6.    | 4.25    |          | 16.   | 4       |          | 26.   | 4.5     |          |
| 7.    | 3.75    |          | 17.   | .....   |          | 27.   | 4.75    |          |
| 8.    | .....   |          | 18.   | 7.25    |          | 28.   | 3.25    |          |
| 9.    | 3.75    |          | 19.   | 3.75    |          | 29.   |         |          |
| 10.   | 7.97    |          | 20.   | 3.5     |          | 30.   | 7       |          |
| Means | 4.147   | 117.56   | ..... | 4.060   | 115.1    | ..... | 3.788   | 107.4    |

The nitrogen was determined twice, viz. on the 10th day (last day before wine), and on the 19th day (last day but one of wine). Unfortunately there had been some constipation before the 10th day, and the stool was unusually copious and less watery; it represented, in fact, some accumulation, and therefore the nitrogen ought to be credited in part to the previous days.

The following Table gives the results :—

| Days.                           | Weight of stool. |          | Percentage. |        |           | Amount of nitrogen in 24 hours. |
|---------------------------------|------------------|----------|-------------|--------|-----------|---------------------------------|
|                                 |                  |          | Solids.     | Water. | Nitrogen. |                                 |
|                                 | ounces.          | grammes. |             |        |           | grammes.                        |
| 10th day (water drinking) ..... | 7.97             | 226.0    | 32.405      | 67.595 | 1.294     | 2.925                           |
| 19th day (wine drinking) .....  | 3.75             | 106.3    | 21.820      | 78.180 | 1.207     | 1.283                           |



Looking to the mean weight of all the stools, to the particular circumstances of the 10th day's stool, and the very nearly equal percentage of nitrogen on the 10th and 19th days, it may be concluded that the wine did not affect the intestinal discharges either as regards quantity or nitrogen.

#### 6. THE ELIMINATION OF ALCOHOL.

As in the former series, the numerous experiments we had to perform prevented us from thoroughly investigating this difficult problem. We tested the appearance of alcohol in the excreta by the bichromate-of-potassium test as before. The general results were as follows :—

##### *Elimination by the breath.*

In the first period the bichromate test was not tried on the first day ; it was very slightly changed in colour on the 2nd, 3rd, and 4th days, when the breath was blown through the test for 15 minutes about 2 o'clock. On the remaining 5th, 6th, 7th, 8th, 9th, and 10th days, no change was produced. On the 1st day of wine after dinner, the colour became green in eight minutes, on the 2nd day in six minutes, and subsequently a little sooner. On the 16th and subsequent days (when the wine was doubled) the change was much greater. In the evening, except in one or two cases, no change was produced. On the 21st day (1st day after wine) and subsequent days there was no alteration.

The breath was condensed by a freezing-mixture on the 9th day about 4 o'clock ; about  $\frac{1}{2}$  cub. centim. was collected ; it was tested for alcohol by the Iodoform test, but none was found ; it was unfortunately not examined by the bichromate test. On the 20th day (20 ounces of wine) the breath was again condensed ; it gave an immediate marked green reaction with the bichromate test. On the 22nd day (the 2nd after the wine) it was again condensed, and gave still an immediate reaction, though not so marked as on the 20th day ; so that two days after the wine was left off, some was passing off by the lungs, though it was not detected by merely breathing through the test.

On the 25th and 28th days, when the breath was again condensed, no effect was produced on the bichromate test.

##### *Elimination by the skin.*

In the former series of experiments, when the perspiration was obtained by putting the arm in an hermetically sealed glass jar, no effect was produced in the bichromate test by the sweat before alcohol had been taken.

But on this occasion, when 12 cub. centims. of perspiration were collected in four hours on the 5th day, the bichromate test was at once made green. No alcohol was detected by the Iodoform test, but we are not certain if this can be relied upon. This was on the 17th May, and no alcoholic liquid had been taken since the 25th April.



It seemed improbable that alcohol, taken so long before, could be still passing off; and if not, then the perspiration may at times contain some non-alcoholic substance capable of reducing the bichromate.

The perspiration of the arm was condensed on the 10th day (before wine), on the 19th day (during wine), and on the 26th, 28th, and 30th days (after wine). In all cases an extremely marked green reaction was at once given.

We conclude, therefore, that fresh experiments are necessary with regard to the correctness of the bichromate test, when applied to the condensed perspiration.

*Elimination by the kidneys.*

The examination was conducted in the same way as on the former occasion, the urine being first distilled, the distillate tested with the bichromate test, and if no reaction was given redistilled.

The following Table gives the results:—

| Days.                       | Reaction with bichromate.                      |   |
|-----------------------------|--|---|
|                             | 1st distillate.                                | 2nd distillate.                                 |
| 6th day (water).....        | A very slight and scarcely perceptible change. | A very slight change, scarcely to be affirmed*. |
| 15th day (wine, 10 oz.) ... | No change.                                     | No change*.                                     |
| 16th day (wine, 20 oz.) ... | No change.                                     | No change*.                                     |
| 18th day (wine, 20 oz.) ... | No change.                                     | Slight.   |
| 20th day (wine, 20 oz.) ... | Slight.  | Marked.   |
| 22nd day (water) .....      | None.  | None.   |
| 27th day (water) .....      | None.  | None.   |

We conclude from this Table that when 10 ounces of wine (containing 1·1 ounce of absolute alcohol) were taken, no alcohol passed into the urine. On the 16th day, when 20 ounces (=2·2 ounces of absolute alcohol) were taken, none was found in the urine; the next day no examination was made, but on the 18th day alcohol was detected, and two days later the reaction was marked. Two days after the wine was left off no alcohol was found.

Therefore, when this man took 2 ounces of absolute alcohol day after day, some of it was eliminated by the urine. When he took only 1 ounce, none was eliminated during the space of five days. If, as has been surmised by Dr. Anstie, the appearance of alcohol in the urine indicates that there is an excess in the body, it seems clear that this man cannot take much more than 1 ounce without the urine giving evidence of it, and thereby proving excess. It soon disappeared from the urine, certainly on the 2nd day (the first day's urine was not examined), whereas, on the former occasion, when a much larger quantity had been taken, it could be detected five days after it had been discontinued.

\* Tested also with the Iodoform test. No reaction.



*Elimination by the bowels.*

No experiments were made.

## GENERAL CONCLUSIONS.

1. The general results of these experiments are in all respects identical with the experiments on alcohol and brandy, that is to say, there was a marked effect on the heart, coinciding tolerably well in amount with the effect produced by pure alcohol in the former experiments; there was no unequivocal alteration of temperature in the axilla or rectum, no alteration in the elimination of nitrogen, for the increase in the last period cannot be credited to the direct effect of the wine; no alteration in the phosphoric acid of the urine; some augmentation of the free acidity of the urine; no alteration of the alvine discharges. In other words, claret-wine in the above quantities cannot so far be distinguished in its effect from pure alcohol. Its most marked effect, the increase of the heart's action, must be ascribed to the alcohol, in great measure, though the ethers may play some slight part.

But it would be going too far to assert that the dietetic effects of red Bordeaux wine and of dilute alcohol are identical. The difference between them must probably be sought in their effects on primary digestion and assimilation, delicate and subtle influences which experiments like those recorded in the paper do not touch. The influence of the sugar, of the salts, and of the acidity must also be appreciated by other methods. The man himself affirmed that the wine agreed with him better than the alcohol or brandy, but the large quantity he took of these last fluids vitiates the comparison.

These experiments on wine enabled us to define somewhat better than the previous trials what might be considered moderation for this man. The 10 ounces of wine, containing about 1 fluid ounce of pure alcohol, did not cause the least unpleasant feeling of heat or flushing. The 20 ounces (containing almost 2 fluid ounces of alcohol) were manifestly too much. He felt hot and uncomfortable, was flushed, the face was somewhat congested, and he was a little drowsy. Moreover, as already mentioned, alcohol then began to appear in the urine. Therefore he ought certainly not to take much more than 1 fluid ounce of absolute alcohol in 24 hours.

With regard to the propriety of this healthy man taking any alcohol, we have no hesitation in saying he would be better without it. His heart naturally acts quickly and strongly enough; alcohol increases its action too much, and might lead on to alteration in its condition, or to injury of vessels, if any degeneration were to take place in them. This man had gone through the Abyssinian campaign, and stated that when the force was without rum, owing to deficiency of transport beyond Antalo, he had in no way felt the want of the stimulant, though some of his comrades did. This seems to confirm our opinion, that alcohol for him is not a necessity, and indeed is not desirable.







FURTHER EXPERIMENTS

ON THE

EFFECT OF DIET AND EXERCISE

ON THE

ELIMINATION OF NITROGEN.

BY

E. A. PARKES, M.D., F.R.S.

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IN the Proceedings of the Royal Society (No. 89, 1867, and No. 94, 1867) some experiments were published on the elimination of nitrogen, during exercise and rest, on a nitrogenous and a non-nitrogenous diet. The result of both series was so far to confirm the experiments which show that the changes in the nitrogen of the urine and fæces are small in extent and afford no measure of the work; but there did appear to be a slight effect produced in two ways:—



1. There was an increased, though slight, outflow of nitrogen after work.
2. There was apparently a slight lessening of the outflow during work, not dependent on diminution in the amount of urinary water. In the state of rest also, when the diet was equal, there was no lessening, but a slight excess, in the excretion of nitrogen as compared with a period both of forced and ordinary exercise.

Professor Karl Voit, of Munich, who has a worldwide reputation for his numerous and important contributions to this subject, and who denies that exercise produces any change in the nitrogen, has taken exception to some of these experiments, on the ground more particularly that the daily ingress of nitrogen could not have been kept sufficiently stable. I believe the experiments, showing as they do in two men a remarkable agreement in the amount of nitrogen eliminated, and the fact that the two great articles of diet by which nitrogen enters (meat and bread) were selected and weighed with great care\* and from the analyses appeared to be of constant composition, prove that the alterations in the daily inflow of nitrogen must have been very small and less than those of the outflow.

Undoubtedly, however, to insure an absolute uniformity in the entrance of nitrogen in men, is a very difficult matter as long as only ordinary diet is given. The employment of prepared or concentrated food, on the other hand, cannot be considered as good as common diet for such experiments; for the body is unaccustomed to the particular form in which the food is given.

It was determined to repeat the experiments in two or three ways. First, not only to use ordinary diet with the usual attention to keep it as uniform as possible from day to day, but to select hours for rest and exercise when the influence of diet is least perceptible, viz. twelve or fourteen hours after food; then in a second series to use prepared food in which the amount of nitrogen is absolutely constant; and thirdly to use a diet without nitrogen.

Unfortunately the experiments on preserved food failed on account of the health breaking down in a few days and before any exercise could be taken. On the ordinary diet also an unexpected difficulty arose, but still the results are worthy of record. The experiments on the non-nitrogenous diet are confirmatory of the former results, as far as the increased elimination after exercise is concerned.

As the details of the experiments would occupy too much space, I have given only mean numbers when these were sufficient to fairly show the results, and have omitted all details of the chloride of sodium, free acidity of the urine, and other matters.

The subject of the experiments was T. C., a perfectly healthy soldier

\* The meat was beefsteak, and was selected free from visible fat, and was always cooked in the same way, *i. e.* fried. The bread was the hospital bread, made daily with the same flour, water, and salt, baked at the same heat and for the same time, and having the same amount of crust and crumb.



who had never had a day's illness in his life. He was 25 years of age, weighed usually 145 lbs., and is of very temperate habits. He had been an iron-worker before enlistment, and is an extremely powerful man; the girth of the chest was  $37\frac{3}{4}$  inches.

#### FIRST SERIES OF EXPERIMENTS.

##### *Ordinary regulated diet.*

During 20 days the man received daily beefsteak weighing 14 ounces when raw, 1 ounce of fat for cooking, 16 ounces of bread, 1 ounce of butter, 6 ounces of milk, 16 ounces of potatoes,  $1\frac{1}{2}$  ounce of sugar, 36 fluid ounces of infusions of tea and coffee, and 16 ounces of water. The amount of nitrogen was determined at 300 grains; it might be a little more or less, but still from day to day its amount was the same as far as it could possibly be kept so. This diet was selected in this, as in the former experiments, because it is the usual ration of the Army Hospital Corps to which this man belonged, and therefore there was no fear of a change in the food itself producing any effect.

He took his meals always at the same time; viz. breakfast at 10 A.M., dinner at 3 P.M. (when he took the whole of his meat), and tea at  $\frac{1}{4}$  to 6. After tea he took 6 ounces of water at 10 P.M., but no solid food.

The urine was collected from 10 A.M. to 6 A.M. on the following morning; then from 6 A.M. to 8 A.M. and from 8 A.M. to 10 A.M. As all food was taken between 10 A.M. and 6 P.M., it was expected that the urine from 6 A.M. to 10 A.M. (viz. from the 13th to the 16th hours after food) would be of tolerably constant composition; at any rate there would be less chance of error from the effect of food. In this way, and by keeping as far as possible an equal daily diet, it was hoped to lessen or remove the chances of fallacy from varying ingress of nitrogen. An unexpected circumstance partly disconcerted this hope.

It was anticipated that the amount of urine passing in the two hours from 8 to 10 A.M. would be less than in the two hours from 6 to 8, as being further removed from the time when fluid was taken. But the result was otherwise; there was always more urine passed from 8 to 10 A.M. than in the previous two hours. When this was first noted, it was supposed that an error in collecting the urine had been made; but day after day the result was the same. It seemed to be owing to the influence of sleep and wakefulness. From 6 to 8 the man slept, but from 8 to 10 he was not only awake, but his mind was active, and he talked to two men who worked in the room where he slept; and though his body was kept as quiet as during the previous two hours, the mental condition seemed to cause an increased passage of urine; at least there seemed nothing else to account for the fact that on every day during ten days while he was still in bed, there was more urine passed from 8 to 10 than from 6 to 8 A.M., although no water had been taken except at 10 the night before. The result was



that the urea did not fall as was expected, though its percentage was lessened.

Liebig's mercuric nitrate solution (the chloride of sodium being got rid of and the usual correction for dilution being made) and Voit's plan for the determination of nitrogen by soda-lime were both used, so as to afford a control of the observations.

The daily weight of the body, the temperature of the axilla and rectum, the pulse, the weight of the stools, &c. were also determined. Almost all the experiments were repeated, and several were performed three and four times\*.

During the first ten days he remained in bed from 10 P.M. to 10 A.M., taking during the day his ordinary exercise. During the second 10 days he went to bed at 10 P.M. as before, got up at 6 A.M., worked for two hours, and then went to bed again at 8 A.M. until 10 A.M. The work consisted in dragging a cart weighing 710 lb. 4 miles in two hours. Supposing the coefficient of traction to be the same as in walking, the amount of work calculated by Haughton's formula would be equal to about 100 tons lifted one foot. His weight at the commencement of the experiment was 146 lb. 2 oz.; it fell regularly during 10 days to 144 lb. 10 oz., viz. 1 lb. 8 oz. During the second 10 days it fell to 142 lb. 12 oz., a loss of 1 lb. 14 oz.

The following are the mean results in the first and second sections of 10 days.

Mean amount of urine, in cub. centims.

|                              | 6 A.M.<br>to<br>8 A.M. | 8 A.M.<br>to<br>10 A.M. | 10 A.M.<br>to<br>6 A.M. | Total. |
|------------------------------|------------------------|-------------------------|-------------------------|--------|
| 1st section of 10 days ..... | 71·65                  | 100·4                   | 1077·45                 | 1249·5 |
| 2nd section of 10 days ..... | 75·6                   | 85·8                    | 1068·8                  | 1229·4 |

There was a slight decrease in the urinary water in the two hours of rest following the two hours' exercise.

Mean amount in grammes of mercuric nitrate precipitate taken as urea.

|   | 6 to 8. | 8 to 10. | 10 to 6. | Total. |
|---|---------|----------|----------|--------|
| 1st section of 10 days, }<br>usual exercise† .....                        | 3·056   | 2·902    | 35·189   | 41·147 |
| 2nd section of 10 days, }<br>2 hours additional<br>exercise from 6 to 8 } | 3·142   | 2·974    | 36·017   | 42·133 |

\* Count Wollowicz commenced these experiments with me, but was obliged to discontinue them on account of the illness which eventually proved fatal. Serjeant Turner, of the Army Hospital Corps, very carefully took most of the observations on the temperature and the pulse.

† One day's urea from 6 to 10 A.M. is omitted as the urine was lost.



The results show no diminution in the urea during the two hours of exercise; the slight increase may perhaps be disregarded. In the two hours of rest, there is equally inconsiderable increase after exercise; the excess in the 4 hours of the second section of 10 days was 1.58 gramme. In the next 20 hours there was an increase of .828 gramme, equal to .3864 gramme, or 6 grains of nitrogen. The differences are so small as probably to fall within the limit of error, and it is impossible to affirm that exercise to the amount of 100-foot tons in two hours made any alteration in the urea.

Mean amount of nitrogen as determined by soda-lime.

|   | 6 to 8. | 8 to 10. | 10 to 6. | Total. |
|---|---------|----------|----------|--------|
| 1st section of 10 days*:<br>rest from 6 to 10 A.M. .... }                             | 1.489   | 1.492    | 16.902   | 19.883 |
| 2nd section of 10 days:<br>exercise from 6 to 8 A.M.,<br>rest from 8 to 10 A.M. ... } | 1.438*  | 1.399    | 16.924   | 19.761 |

The nitrogen by soda-lime showed very slight variations. There was a slight decrease in the 2 hours' exercise and in the 2 hours' rest after exercise over the corresponding period; but it is so trifling that I hesitate to draw any conclusions. The figures show that the slight increase in the urea was, as supposed, an unavoidable error. Looking to the figures of the nitrogen by soda-lime as more correct, it seems that 2 hours' additional exercise produced no marked change in the outflow when the inflow of nitrogen was constant. This result, as far as it goes, certainly bears out Voit's assertion of the constancy of the nitrogen, but it does not destroy the conclusions formerly drawn that the nitrogen lessens during exercise and increases afterwards, because the amount of exercise was in the present case very much less; and as the alteration in the nitrogen even in the former experiments, with much more severe exercise, fell within narrow limits, it might easily have been anticipated that work of only one-sixth the amount would be inappreciable. The method of experimenting also does not appear to me to be so good as that formerly used.

Amount of nitrogen, in grammes, in the stools.

|                         | Percentage composition. |        |           | Amount in 24 hours. |         |           |
|-------------------------|-------------------------|--------|-----------|---------------------|---------|-----------|
|                         | Solids.                 | Water. | Nitrogen. | Solids.             | Water.  | Nitrogen. |
| 8th day of 1st period.. | 21.592                  | 78.048 | 1.166     | 42.929              | 152.691 | 2.279     |
| 7th day of 2nd period.  | 25.00                   | 75.00  | 1.379     | 26.115              | 78.345  | 1.441     |

\* The nitrogen in the 2 first days is not included in the mean of the hours 6 to 10, as the urine was lost on one occasion, and on the other the experiment was uncertain. The mean of these hours (6 to 10) is therefore for 8 days.



On the 8th day there was a large stool, showing previous accumulation. Taking the weight of all the stools during the two sections of 10 days, and using the percentage composition of nitrogen of the one day in each series, the mean daily excretion of nitrogen was 1.807 gramme in the 1st section, and 1.766 gramme in the 2nd section of 10 days.

The pulse and the temperature of the axilla were taken every two hours from 6 A.M. to 10 P.M. The temperature is in Fahr. degrees:—

Mean pulse and temperature.

First section of 10 days.

|                       | Hours. |       |       |       |       |       |       |       |       | Mean of day. |
|-----------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|
|                       | 6.     | 8.    | 10.   | 12.   | 2.    | 4.    | 6.    | 8.    | 10.   |              |
| Pulse .....           | 64.6   | 66.3  | 67.8  | 79.3  | 65.5  | 75    | 74.6  | 74.2  | 69.5  | 70.65        |
| Temp. of axilla ..... | 97.94  | 98.04 | 98.32 | 98.62 | 98.32 | 98.48 | 98.49 | 98.52 | 98.41 | 98.32        |
| Temp. of rectum ...   | .....  | 99.1  | ..... | 99.2  | ..... | 99.27 | ..... | 99.48 | ..... | 99.26        |

Second section of 10 days.

(Additional exercise from 6 to 8 o'clock.)

|                       | Hours. |       |       |       |       |       |       |       |       | Mean of day. |
|-----------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|
|                       | 6.     | 8.    | 10.   | 12.   | 2.    | 4.    | 6.    | 8.    | 10.   |              |
| Pulse .....           | 62.4   | 82.2  | 68.4  | 76    | 68    | 74.4  | 69    | 69.9  | 64.6  | 70.42        |
| Temp. of axilla ..... | 98.24  | 98.24 | 98.33 | 98.23 | 98.41 | 98.45 | 98.42 | 98.44 | 98.38 | 98.34        |
| Temp. of rectum ...   | .....  | 99.4  | ..... | 99.2  | ..... | 99.22 | ..... | 99.22 | ..... | 99.26        |

The effect on the pulse of the exercise from 6 to 8 in the 2nd period was interesting. The exercise brought up the pulse 16 beats at 8 o'clock over the corresponding period; but the pulse afterwards fell below the beats of the 1st period, and the result was a perfect balance of the day's work, so that the mean pulse of the day was the same in both periods. This shows how completely the heart, if called on for exertion, compensates itself by subsequent rest. The exercise made little difference in the temperature of axilla or rectum; there was a slight rise at 8 A.M. corresponding with the pulse after exercise in both axilla and rectum, but the mean of the day was the same.

SECOND SERIES.

*Prepared concentrated food.*

It was proposed to give prepared food of uniform composition, so that the daily ingress of nitrogen would be absolutely constant. I was unable to obtain the "pea-sausage" which the German troops are now using in the Field, and used instead a concentrated food which had been sent by an inventor to Sir Galbraith Logan, and by him sent to Netley for report.



It was composed of bread, meat, potatoes, sugar, spices and salt dried together, &c., and was stated to contain everything necessary for nutrition, so that the troops on service would need no other food. It contained 13.65 per cent. of water and 2.73035 per cent. of nitrogen. After preliminary trials to know how much would satisfy hunger, 14 ounces were given daily, containing 10.838 grammes of nitrogen. The food, however, produced such derangement in nutrition (indigestion, heartburn, and headache) that after a few days the experiments were discontinued. In spite of the constant ingress, the elimination of nitrogen varied greatly from day to day, the extreme range being from 7.641 to 15.024 grammes; and the man felt so ill that he begged to discontinue the experiment. It was interesting to note that, in spite of the daily variations in the nitrogen, there passed out in the 5 days nearly the same quantity as entered, viz. 54.920 grammes of exit, as against 54.19 grammes of entrance. He lost weight during the trial. The experiment must be therefore repeated on some future occasion with other prepared food.

### THIRD SERIES.

#### *Non-nitrogenous food.*

In the experiments formerly related in the 'Proceedings' two men were kept for 2 days at a time without nitrogen. As it seemed to do no harm, the present experiments were now prolonged over 5 days on two occasions. The first was after the man had been well fed with nitrogen, the second after the body had become poor in nitrogen from the restricted supply given in the concentrated food. The non-nitrogenous food consisted of arrowroot, butter (deprived of casein), and lump sugar. Infusion of tea without milk was allowed, but this contained in the day only  $\frac{1}{2}$  grain of nitrogen. Hunger was perfectly satisfied by this food; the man felt quite well and could have continued it. The heartburn produced by the concentrated food was at once relieved by this starch and fat diet.

#### *First Experiments on Non-nitrogenous Food.*

Previous daily entry of nitrogen = 19.5 grammes.

On the first day of non-nitrogenous food he took his ordinary exercise; on the 2nd took additional exercise, which consisted in digging up potatoes over 576 square feet, lifting the weight (16 stone) into a barrow, and wheeling them home for  $\frac{1}{2}$  a mile. On the 3rd day he rested, on the 4th repeated the exercise, on the 5th rested. He did the 4th day's work even better than the 2nd, and could have worked on the 5th day.

The amount of work done cannot easily be calculated; it was a good but not an excessive day's work.

The weight on the first day was 142 lb. 7 oz., and on the last 141 lb. 10 oz. He took daily 60 fluid ounces of water (= 1704 cub. centims.), and as much arrowroot, oil of butter, and sugar as he liked.



## Urinary water, in cub. centims.

|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Total. |
|---------------------------|------------------------|------------------------|--------|
| 1st day, usual work ..... | 676.5                  | 430                    | 1106.5 |
| 2nd day, exercise .....   | 660                    | 270                    | 930    |
| 3rd day, rest .....       | 780                    | 210                    | 990    |
| 4th day, exercise .....   | 415                    | 87                     | 502    |
| 5th day, rest .....       | 715                    | 140                    | 850    |

## Urea, in grammes.

|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Total. |
|---------------------------|------------------------|------------------------|--------|
| 1st day, usual work ..... | 16.768                 | 8.514                  | 25.282 |
| 2nd day, exercise .....   | 7.986                  | 4.293                  | 12.079 |
| 3rd day, rest .....       | 3.042                  | 3.087                  | 6.123  |
| 4th day, exercise .....   | 3.652                  | 2.540                  | 6.192  |
| 5th day, rest .....       | 4.290                  | 3.066                  | 7.356  |

## Nitrogen.

|                           | Nitrogen by soda-lime. |                        | Total in 24 hours.           |                                      |
|---------------------------|------------------------|------------------------|------------------------------|--------------------------------------|
|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Nitrogen<br>by<br>soda-lime. | Nitrogen<br>calculated<br>from urea. |
| 1st day, usual work ..... | 8.287                  | 4.304                  | 12.591                       | 11.798                               |
| 2nd day, exercise .....   | 3.782                  | 2.381                  | 6.163                        | 5.728                                |
| 3rd day, rest .....       | 1.692                  | 1.396                  | 3.088                        | 2.859                                |
| 4th day, exercise .....   | 1.764                  | .9196                  | 2.684                        | 2.889                                |
| 5th day, rest .....       | 2.052                  | 1.333                  | 3.383                        | 3.433                                |

The effects of exercise and rest are complicated with the gradually decreasing elimination dependent on the supply of nitrogen being cut off, consequently nothing can be concluded from the lessening of nitrogen on the 2nd day (exercise). On comparing the 3rd and 4th days (rest and exercise), the nitrogen by soda-lime shows a decrease on the exercise day; but as the ureal nitrogen is almost precisely the same on the two days, it does not seem possible to affirm a decrease. The most positive result is the increase of nitrogen (as shown by both methods) on the 5th day (rest after work). There was a decided excess, amounting to .699 grammes or very nearly 19 per cent. Such an increase occurring on the 5th day after the supply of nitrogen was cut off, seems inexplicable unless on the supposition that it was owing to the previous muscular exertion.

I felt, however, that this experiment might be better conducted. The exercise was commenced too soon, and before the nitrogen had reached its



lowest point. The kind of exercise, too, viz. digging, which is often attended with intervals of rest, was not a good choice. Moreover, on the 3rd and 4th days he took some common salt, which might possibly have interfered, as it is supposed that chloride of sodium augments the outflow of urea.

The experiment was therefore repeated at the period when the body was poor in nitrogen from the use of the concentrated food.

*Second Experiments on Non-nitrogenous Food (Arrowroot, Oil of Butter, and Sugar).*

Previous daily entry of nitrogen = 10.838 grammes.

In this series the man did his ordinary work, which was not severe, and tolerably uniform, during the first 3 days. Then on the fourth day he marched 32 miles on level ground, carrying the new valise equipment, the service-kit, 40 rounds of ball ammunition, rifle, bayonet, and great coat. In all the weight was  $43\frac{1}{2}$  lb., his own weight being  $145\frac{1}{2}$  lb. The work done was therefore 712.8 tons lifted a foot, or, in other words, it was an extremely hard day's work. He did 26 miles quite easily, but then was greatly fatigued and got very tender about the feet, and had pains in the calves of the legs. The next day he was, however, quite well, and declared that he did not feel in the least weakened from having been 5 days on starch and butter. The march commenced at 8 A.M., and with intervals of  $1\frac{1}{2}$  hour for meals, lasted till 7.30, so that actual muscular work both of arms and legs was going on for 10 hours. The daily ingress of chloride of sodium was uniform during the 5 days.

Elimination of urinary water, in cub. centims.

|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Total. |
|---------------------------|------------------------|------------------------|--------|
| 1st day, usual work ..... | 950                    | 570                    | 1520   |
| 2nd day, usual work.....  | 920                    | 550                    | 1470   |
| 3rd day, usual work.....  | 800                    | 470                    | 1270   |
| 4th day, marching .....   | 585                    | 325                    | 910    |
| 5th day, rest .....       | 765                    | 495                    | 1260   |

Urea, in grammes.

|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Total. |
|---------------------------|------------------------|------------------------|--------|
| 1st day, usual work ..... | .....                  | .....                  | 13.072 |
| 2nd day, usual work.....  | .....                  | .....                  | 10.731 |
| 3rd day, usual work ..... | .....                  | .....                  | 9.271  |
| 4th day, marching .....   | 4.563                  | 2.762                  | 7.323  |
| 5th day, rest .....       | 9.562                  | 6.435                  | 15.997 |



## Nitrogen by soda-lime.

|                           | 8 A.M.<br>to<br>8 P.M. | 8 P.M.<br>to<br>8 A.M. | Total in<br>24 hours. | Total nitrogen<br>calculated<br>from urea. |
|---------------------------|------------------------|------------------------|-----------------------|--|
| 1st day, usual work ..... | .....                  | .....                  | 5.936                 | 6.100                                      |
| 2nd day, usual work ..... | .....                  | .....                  | 5.427                 | 5.008                                      |
| 3rd day, usual work ..... | .....                  | .....                  | 4.328                 | 4.327                                      |
| 4th day, marching .....   | 2.451                  | 1.361                  | 3.812                 | 3.418                                      |
| 5th day, rest .....       | 4.997                  | 3.268                  | 8.265                 | 7.465                                      |

The effect of the previous small entry of nitrogenous food is clearly seen ; on the 1st day the nitrogen fell almost to the amount of the 2nd day in the previous experiments. On the 3rd day, on the contrary, it was greater than on the corresponding day of the former series.

The amount of nitrogen was actually greater on the 5th day than on the 1st. Except the excessive exercise of the 4th day, no other obvious cause existed for this elimination on the 5th day. No mistake seems possible ; for the urinary water on the 5th day was less in quantity than on the 1st, 2nd, and 3rd days, while the nitrogen was 2 grammes more than even on the 1st day after nitrogenous food was left off. An error in analysis is not possible, since not only were the analyses repeated, but the process by urea gave results corresponding to that by soda-lime. No constitutional condition which could cause excess in elimination was indicated either by the pulse or body temperature, and the man felt perfectly well. I need hardly say that no nitrogenous food was taken ; for it is quite certain that it was not.

The increase in the 5th day in the 1st series, though less marked, is still unequivocal, and there seems therefore no rashness in stating that the conclusion of the experiments formerly laid before the Society is affirmed, viz. that severe exercise causes an increase in the elimination of nitrogen in the period of rest after the exercise. It is noticeable that in this man the increased elimination was not in the hours immediately succeeding, but on the following day, and lasted for some time.

Whether during the period of exercise the nitrogen was lessened is not so clear, as the fall from 4.328 grammes on the 3rd day to 3.812 on the 4th or exercise day might be merely the continuing effect of the deprivation of nitrogen. The experiments formerly recorded seem to me better adapted to determine this point, which, however, certainly requires more evidence in confirmation before it can be accepted.

That changes go on in the muscles during exercise which lead to an increase in the outflow of nitrogen afterwards must, I think, be admitted ; and on this point it seems that the statement of Liebig must be supported against Voit.

It may be interesting to give the mean pulse and temperature during these days of non-nitrogenous feeding for comparison with the normal.



During the day of exercise, however, the observations at 10 A.M. and 2 P.M. on the pulse and all the temperature observations on the marching day were lost, except at 8 A.M. and 8 P.M.

On a diet without nitrogen.

Mean pulse.

|                | Hours. |         |          |        |        |        |        | Mean<br>of day. |
|----------------|--------|---------|----------|--------|--------|--------|--------|-----------------|
|                | 8 A.M. | 10 A.M. | 12 NOON. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. |                 |
| 1st 5 days ... | 64·4   | 69·6    | 69·2     | 73·6   | 70·2   | 75·8   | 72·6   | 70·77           |
| 2nd 5 days...  | 68     | 70·25   | 75·2     | 75     | 74     | 75·6   | 72·6   | 72·95           |

Mean temperature of axilla.

|                | Hours. |        |         |          |        |        |        |        | Mean<br>by day. |
|----------------|--------|--------|---------|----------|--------|--------|--------|--------|-----------------|
|                | 6 A.M. | 8 A.M. | 10 A.M. | 12 NOON. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. |                 |
| 1st 5 days ... | 98·08  | 98·16  | 98·36   | 98·36    | 98·32  | 98·32  | 98·36  | 98·36  | 98·29           |
| 2nd 5 days...  | .....  | 98·08  | 98·15   | 98·25    | 98·2   | 98·15  | 98·5   | 98·15  | 98·16           |

Mean temperature of rectum.

|                | Hours. |         |          |        |        |        |        | Mean<br>of day. |
|----------------|--------|---------|----------|--------|--------|--------|--------|-----------------|
|                | 8 A.M. | 10 A.M. | 12 NOON. | 2 P.M. | 4 P.M. | 6 P.M. | 8 P.M. |                 |
| 1st 5 days ... | 99·0   | .....   | 99·2     | .....  | 99·4   | .....  | 99·4   | 99·25           |
| 2nd 5 days...  | 98·7   | .....   | 99·04    | .....  | 99·24  | .....  | 99·48  | 99·115          |

The mean pulse on the 5th day of the 1st series of non-nitrogenous food was 69·3, and 67·9 on the 5th day of the 2nd series. Both these were rest days, when the heart would naturally beat rather less. Non-nitrogenous diet does not, therefore, materially affect the number of beats of the pulse; but it decidedly influenced its volume, rendering it smaller, far softer, and more compressible when felt with the finger, and it gave a feeble sphygmographic tracing.

The sphygmographic tracings show this clearly. Ten tracings were taken at 6 A.M. on successive days, when the man was on nitrogenous food, 15 hours after dinner and 12 after the last food. They represent, therefore, the tracings of inanition. Five tracings were taken on successive days at 6 A.M. on the non-nitrogenous food. The same instrument and an equal pressure were always used. The height to which the lever was raised (all conditions of pressure &c. being equal) will therefore show the expansion of the artery. The tracings were carefully measured, and the following is the result:—



Height of upright line in  
the sphygmographic  
tracing at 6 A.M.,  
in inches.

|  |      |             |
|--|------|-------------|
| 1st day, nitrogenous food, pulse 12 hours after food | .... | 0.1375      |
| 2nd  | ”    | .... 0.1625 |
| 3rd  | ”    | .... 0.1437 |
| 4th  | ”    | .... 0.2000 |
| 5th  | ”    | .... 0.1262 |
| 6th  | ”    | .... 0.1187 |
| 7th  | ”    | .... 0.1500 |
| 8th  | ”    | .... 0.1125 |
| 9th  | ”    | .... 0.2125 |
| 10th   | ”    | .... 0.1375 |

Mean.....0.1501

|                               |       |              |
|-------------------------------|-------|--------------|
| 1st day, non-nitrogenous food | ..... | 0.0750       |
| 2nd                           | ”     | ..... 0.0810 |
| 3rd                           | ”     | ..... 0.1250 |
| 4th                           | ”     | ..... 0.0761 |
| 5th                           | ”     | ..... 0.0625 |

Mean.....0.0839

With an equal pressure the lever was thrown almost double the height when the man was on nitrogenous food. This feebleness of expansion shown by the sphygmograph was quite in accordance with the impression given to the finger. The softness of the pulse proved it was not owing to increased resistance of the arterial wall.

With regard to the temperature, the means are so close to those of the days on ordinary diet, that having regard to the fact that the period was shorter and therefore more liable to error, and that some observations were omitted on the marching-day, it may be concluded that a non-nitrogenous diet continued for 5 days neither raised nor lowered the temperature of the axilla and rectum.

It therefore appears that when the nitrogenous food of a healthy man was reduced to one half for 5 days, and he was then kept for 5 days more without nitrogen, he was able on the 4th day after such deprivation to do a very hard day's work. The non-nitrogenous diet, consisting of butter oil, starch, and sugar, kept him perfectly well; all functions seemed natural, the temperature of the body was unaltered, the pulse became very soft, and the sphygmographic tracings showed very feeble markings; but it was not materially altered in frequency. The circulation appeared to be properly carried on, as far as could be judged of by the man's own feelings. The health, as judged of by the man's feelings and the absence of objective signs, was perfect. On account, however, of the feebleness of the heart's



action it was not thought right to continue the experiments, which had, I believe, sufficiently proved that force necessary for great muscular work can be obtained by the muscles from fat and starch, though changes in the nitrogenous constituents of the muscles also go on which have as one effect an increased though not excessive elimination of nitrogen after the cessation of the work.



Before it was not thought right to mention the experiments which had been made, but it was found that these experiments were not necessary for the purpose of the study, and that the results of the experiments in the laboratory were not in accordance with the results of the experiments in the field. It was found that the results of the experiments in the laboratory were not in accordance with the results of the experiments in the field. It was found that the results of the experiments in the laboratory were not in accordance with the results of the experiments in the field.



(M.27)

ON THE

INFLUENCE OF BRANDY

ON THE

BODILY TEMPERATURE, THE PULSE,

AND THE

RESPIRATIONS OF HEALTHY MEN.

BY

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In the Proceedings of the Royal Society (Nos 120, 123, and 136) the details of experiments are given which show that in two healthy men pure ethyl alcohol, brandy, and claret, given at intervals during the day, produced no effect on the temperature of the body as measured in the axilla and rectum.

This result is in accordance with the experiments of several other observers, while there are some experimenters who have noticed a decrease in temperature in healthy men after the use of alcohol. In some cases of disease in men and in some healthy animals alcohol has caused, it would seem, a decided lessening of temperature.



These differences of statement led me to conceive that the time when the alcohol was given might have some effect.

In the experiments formerly reported to the Royal Society, alcohol was usually given either with or at no long interval from food. As food raises the temperature of the body, it occurred to me that it might mask an opposite action of the alcohol; and I therefore determined to repeat the experiments, and to give the alcohol about four hours after a moderate breakfast, when the heating-effect of the food had gone off, and when digestion was completed, and also to give it in a state of complete inanition.

*I. Experiments after the completion of Digestion.*

The subject of the observations is a strong healthy soldier, T. R., aged 25, height 5 feet 8 $\frac{3}{4}$  inches, weight (naked) 67.46 kilogrammes, or 148 lbs. He has at times drunk some quantity of spirits, but not for the last two or three years, and usually takes about two or three pints of beer daily.

The course of the experiments was as follows:—His breakfast was taken at 6.30, was finished every day by 7 A.M.; he took for breakfast 8 ounces of bread,  $\frac{1}{2}$  ounce of butter, and 17 fluid ounces of tea with sugar and with 3 ounces of milk. Immediately after breakfast he went to bed again, and did not get out of the recumbent position for any purpose until 2 o'clock. He then dined on 12 ounces of beefsteak, 4 ounces of bread, and 8 ounces of water.

After dinner he took exercise and smoked, had tea (same food as at breakfast) at 6, and a glass of water at 9 P.M., when he went to bed. He took daily precisely the same diet and quantity of water.

Thermometers (tested for accuracy and exactly corresponding) were placed in the axilla and rectum at 6 o'clock, and, except at breakfast, they were removed only for the purpose of being read at first every 30 and then every 15 minutes, and were at once replaced, until 2 o'clock, after which time the temperatures were only taken every two hours.

After several days' preliminary examination (during which time he took no alcohol) the experiments were commenced and carried on for six days without alcohol; then during five days undiluted brandy containing 50 per cent. of absolute alcohol was given once daily, viz. at 11 A.M., four hours after breakfast.

On the first day one fluid ounce of brandy ( $=\frac{1}{2}$  ounce of alcohol) was given, on the second day two ounces, on the third day four ounces, on the fourth day six ounces ( $=3$  ounces of alcohol), and on the fifth day also six ounces. I had intended to give him eight ounces on the fifth day, but the brandy made him so ill, he begged me not to increase the quantity\*.

\* The effect of the six ounces of brandy taken in this way at one time and without water was entirely to destroy appetite, so that he could not force himself to take his food; it also caused a great feeling of depression, sickness, and headache, and increased the flow of urinary water very largely for three hours. The nitrogenous elimination



*Axilla and Rectum Temperatures.*

The following Tables give all the thermometric observations under the three periods of 6 A.M. to 11, 11 to 2, and 2 to 10 P.M.

*Axilla Temperature (Fahrenheit).*

Before Brandy.

Period from 6 A.M. to 11 A.M.

| Hours.             | Days, June 1873. |      |       |      |      |      |
|--------------------|------------------|------|-------|------|------|------|
|                    | 21.              | 22.  | 23.   | 24.  | 25.  | 26.  |
| 6 o'clock ...      | 97.0             | 97.6 | 98.4  | 97.2 | 97.0 | 97.0 |
| 6.30 "             | 97.0             | 97.6 | 98.4  | 97.2 | 97.0 | 97.0 |
| 7 "                | 97.8             | 97.8 | 98.2  | 97.8 | 97.4 | 97.2 |
| 7.30 "             | 97.4             | 97.8 | 98.2  | 98.0 | 98.0 | 98.0 |
| 8 "                | 97.2             | 97.8 | 98.0  | 98.0 | 98.0 | 98.0 |
| 8.30 "             | 97.0             | 97.8 | 98.2  | 98.8 | 98.2 | 98.0 |
| 9 "                | 98.6             | 97.8 | 98.2  | 98.4 | 98.0 | 98.0 |
| 9.30 "             | 98.0             | 97.0 | 98.2  | 98.0 | 98.0 | 97.8 |
| 10 "               | 98.2             | 97.4 | 98.2  | 98.0 | 98.0 | 97.2 |
| 10.30 "            | 98.2             | 97.6 | 98.2  | 98.2 | 98.0 | 98.0 |
| 11 "               | 98.2             | 97.6 | 98.2  | 98.0 | 98.2 | 97.8 |
| Mean of the period | 97.62            | 97.7 | 98.22 | 97.9 | 97.7 | 97.6 |

Period from 11 A.M. to 2 P.M.

|                    |       |       |       |      |      |      |
|--------------------|-------|-------|-------|------|------|------|
| 11.15 o'clock...   | ...   | ...   | 98.4  | 98.2 | 97.8 | 97.8 |
| 11.30 "            | 98.5  | 98.28 | ...   | ...  | ...  | ...  |
| 11.45 "            | ...   | ...   | 98.2  | 98.0 | 98.0 | 97.0 |
| 12 "               | 98.2  | 97.8  | 97.9  | ...  | ...  | 97.4 |
| 12.15 "            | 98.1  | ...   | 97.9  | 97.8 | 98.0 | ...  |
| 12.30 "            | 98.1  | 98.0  | 97.84 | 97.8 | 97.6 | 97.5 |
| 12.45 "            | ...   | ...   | 97.84 | ...  | 97.5 | 97.5 |
| 1 "                | 98.0  | 98.0  | 97.6  | 97.8 | 97.6 | 97.4 |
| 1.15 "             | 97.6  | ...   | 97.8  | ...  | ...  | 97.4 |
| 1.30 "             | ...   | 98.2  | ...   | 97.8 | 98.0 | 97.4 |
| 1.45 "             | 97.6  | ...   | 97.8  | ...  | ...  | 97.4 |
| 2 "                | 97.6  | 98.2  | 97.8  | 97.8 | 97.7 | 97.2 |
| Mean of the period | 97.96 | 98.06 | 97.9  | 97.9 | 97.8 | 97.4 |

Period from 2 to 10 P.M.

|                    |      |       |       |      |      |      |
|--------------------|------|-------|-------|------|------|------|
| 3 o'clock...       | 98.0 | ...   | 97.8  | 97.8 | 97.9 | 98.2 |
| 4 "                | 98.6 | 98.2  | 97.8  | 97.8 | 98.0 | 98.2 |
| 6 "                | 98.0 | 98.4  | 98.6  | 97.8 | 98.8 | 98.4 |
| 8 "                | 98.8 | 98.2  | 98.2  | 98.0 | 98.8 | 98.3 |
| 10 "               | 98.7 | 98.2  | 98.6  | 97.8 | 98.6 | 98.5 |
| Mean of the period | 98.4 | 98.25 | 98.25 | 97.8 | 98.4 | 98.3 |

was not increased, and was probably slightly lessened; but the loss of appetite, which altered the ingress of nitrogen, on one day rendered the experiment rather imperfect. In order not to lengthen the present communication, I reserve all details of the egress of nitrogen and phosphoric acid and alcohol for another opportunity.



## Axilla Temperature.

Brandy at 11 A.M.

Period from 6 to 11 A.M..

| Hours.                        | Days, June 27 and July 1, 1873. |       |       |       |       |
|-------------------------------|---------------------------------|-------|-------|-------|-------|
|                               | 27.                             | 28.   | 29.   | 30.   | 1.    |
| 6 o'clock ...                 | 96.6                            | 97.5  | 97.0  | 97.4  | 96.8  |
| 6.30 "                        | 96.6                            | 97.2  | 97.2  | 97.4  | 97.0  |
| 7 "                           | 97.0                            | 97.0  | 97.2  | 97.4  | 97.2  |
| 7.30 "                        | 97.8                            | 97.2  | 97.2  | 97.6  | 97.2  |
| 8 "                           | 98.0                            | 97.4  | 97.2  | 97.8  | 97.4  |
| 8.30 "                        | 98.0                            | 97.4  | 97.8  | 98.4  | 97.4  |
| 9 "                           | 98.2                            | 98.0  | 97.8  | 98.4  | 98.0  |
| 9.30 "                        | 98.2                            | 98.4  | 97.8  | 98.6  | 98.0  |
| 10 "                          | 98.4                            | 98.4  | 98.2  | 98.5  | 98.2  |
| 10.30 "                       | 98.2                            | 98.4  | 98.0  | 98.2  | 98.4  |
| 11 "                          | 98.2                            | 98.0  | 98.0  | 98.2  | 98.4  |
| Mean of the period            | 97.7                            | 97.72 | 97.58 | 97.98 | 97.6  |
| Period from 11 A.M. to 2 P.M. |                                 |       |       |       |       |
| 11.15 o'clock...              | 98.0                            | 97.0  | 98.0  | 98.2  | 98.6  |
| 11.30 "                       | ...                             | 97.2  | 98.0  | 97.8  | 98.4  |
| 11.45 "                       | 97.8                            | 97.2  | 97.8  | 97.3  | 97.9  |
| 12 "                          | ...                             | 97.4  | 97.8  | ...   | 98.0  |
| 12.15 "                       | 97.9                            | 97.2  | 97.8  | 97.2  | 97.7  |
| 12.30 "                       | 97.8                            | 97.5  | 97.8  | 97.1  | 97.4  |
| 12.45 "                       | 97.8                            | 97.6  | 97.8  | 97.1  | 97.4  |
| 1 "                           | 97.8                            | 97.62 | 97.8  | 96.82 | 97.4  |
| 1.15 "                        | 97.8                            | 97.44 | 97.8  | 97.1  | 97.4  |
| 1.30 "                        | 97.9                            | 97.5  | 97.8  | 96.8  | 97.4  |
| 1.45 "                        | 97.8                            | 97.5  | 97.8  | 97.1  | 97.4  |
| 2 "                           | 97.8                            | 97.5  | 97.8  | 97.0  | 97.4  |
| Mean of the period            | 97.83                           | 97.4  | 97.8  | 97.23 | 97.4  |
| Period from 2 to 10 P.M.      |                                 |       |       |       |       |
| 3 o'clock ...                 | 98.0                            | 97.6  | 98.0  | 98.2  | 97.6  |
| 4 "                           | 98.3                            | 98.2  | 98.0  | 98.4  | 98.0  |
| 6 "                           | 98.2                            | 98.2  | 98.0  | 98.4  | 97.8  |
| 8 "                           | 98.2                            | 98.4  | 98.8  | 98.4  | 98.4  |
| 10 "                          | 97.4                            | 97.3  | 99.0  | 97.6  | 97.4  |
| Mean of the period            | 98.02                           | 97.94 | 98.3  | 98.2  | 97.84 |



## Temperature of Rectum.

Before Brandy.

Period from 6 to 11 A.M.

| Hours.                        | Days, June 1873. |        |       |       |       |       |
|-------------------------------|------------------|--------|-------|-------|-------|-------|
|                               | 21.              | 22.    | 23.   | 24.   | 25.   | 26.   |
| 6 o'clock ...                 | 97.8             | 97.8   | 98.8  | 97.8  | 97.4  | 98.4  |
| 6.30 "                        | 97.8             | 97.8   | 98.8  | 97.8  | 97.4  | 98.4  |
| 7 "                           | 98.2             | 98.4   | 98.8  | 98.2  | 97.8  | 98.4  |
| 7.30 "                        | 98.8             | 98.8   | 99.0  | 98.6  | 97.8  | 98.6  |
| 8 "                           | 98.8             | 98.8   | 99.0  | 98.8  | 98.8  | 98.8  |
| 8.30 "                        | 99.0             | 98.8   | 99.0  | 99.0  | 99.0  | 98.6  |
| 9 "                           | 99.2             | 98.8   | 99.4  | 99.0  | 99.0  | 98.6  |
| 9.30 "                        | 99.2             | 99.2   | 99.2  | 99.0  | 98.8  | 98.6  |
| 10 "                          | 99.2             | 98.8   | 99.2  | 98.8  | 98.8  | 98.6  |
| 10.30 "                       | 98.9             | 99.0   | 98.8  | 99.0  | 98.8  | 98.8  |
| 11 "                          | 98.4             | 98.8   | 98.4  | 98.8  | 98.8  | 98.6  |
| Mean of the period            | 98.67            | 98.6   | 98.96 | 98.6  | 98.5  | 98.6  |
| Period from 11 A.M. to 2 P.M. |                  |        |       |       |       |       |
| 11.15 o'clock                 | ...              | ...    | 99.0  | 99.0  | 98.8  | 98.8  |
| 11.30 "                       | 99.0             | 98.62  | ...   | ...   | 98.8  | ...   |
| 11.45 "                       | ...              | ...    | 99.1  | 99.0  | ...   | 98.8  |
| 12 "                          | 99.1             | 98.8   | 99.0  | ...   | ...   | 98.6  |
| 12.15 "                       | 99.0             | ...    | 99.0  | 99.0  | 98.8  | ...   |
| 12.30 "                       | 99.2             | 98.6   | 98.8  | 98.8  | 98.6  | 98.6  |
| 12.45 "                       | ...              | ...    | 98.8  | ...   | 98.2  | 98.5  |
| 1 "                           | 99.0             | 98.6   | 98.8  | 98.6  | 98.4  | 98.5  |
| 1.15 "                        | 98.8             | ...    | 98.8  | ...   | ...   | 98.5  |
| 1.30 "                        | ...              | 99.2   | ...   | 98.4  | 98.4  | 98.5  |
| 1.45 "                        | 98.8             | ...    | 98.8  | ...   | ...   | 98.5  |
| 2 "                           | 98.8             | 99.0   | 98.8  | 98.4  | 98.5  | 98.2  |
| Mean of the period            | 98.96            | 98.8   | 98.88 | 98.74 | 98.6  | 98.56 |
| Period from 2 to 10 P.M.      |                  |        |       |       |       |       |
| 3 o'clock                     | 99.4             | ...    | 99.4  | 99.0  | 98.8  | 98.8  |
| 4 "                           | 99.5             | 99.6   | 99.8  | 99.2  | 98.8  | 99.6  |
| 6 "                           | 100.4            | 100.2  | 99.6  | 99.2  | 99.4  | 100.2 |
| 8 "                           | 100.8            | 100.6  | 100.4 | 99.2  | 99.6  | 100.0 |
| 10 "                          | 100.65           | 100.6  | 99.6  | 99.4  | 100.2 | 100.4 |
| Mean of the period            | 100.14           | 100.25 | 99.76 | 99.2  | 99.36 | 99.8  |



## Temperature of Rectum.

During Brandy.

Period from 6 to 11 A.M.

| Hours.                        | Days, June 27 to July 1, 1873. |       |       |       |       |
|-------------------------------|--------------------------------|-------|-------|-------|-------|
|                               | 27.                            | 28.   | 29.   | 30.   | 1.    |
| 6 o'clock                     | 97.6                           | 98.4  | 98.0  | 98.0  | 97.4  |
| 6.30 "                        | 97.6                           | 98.4  | 98.4  | 98.0  | 97.6  |
| 7 "                           | 98.0                           | 98.2  | 98.4  | 98.2  | 98.2  |
| 7.30 "                        | 98.4                           | 98.4  | 98.4  | 88.2  | 98.2  |
| 8 "                           | 98.6                           | 98.6  | 98.4  | 98.4  | 98.8  |
| 8.30 "                        | 98.6                           | 98.6  | 98.4  | 99.4  | 98.8  |
| 9 "                           | 99.0                           | 99.0  | 98.4  | 99.2  | 98.8  |
| 9.30 "                        | 99.0                           | 99.0  | 98.4  | 99.4  | 98.8  |
| 10 "                          | 98.8                           | 98.8  | 98.8  | 99.2  | 99.2  |
| 10.30 "                       | 98.8                           | 98.8  | 98.7  | 99.2  | 99.4  |
| 11 "                          | 98.8                           | 98.8  | 98.7  | 99.0  | 99.2  |
| Mean of the period            | 98.4                           | 98.64 | 98.45 | 98.7  | 98.5  |
| Period from 11 A.M. to 2 P.M. |                                |       |       |       |       |
| 11.15 o'clock                 | 99.4                           | 98.8  | 98.8  | 99.2  | 99.4  |
| 11.30 "                       | 99.4                           | 98.6  | 99.6  | 99.0  | 99.4  |
| 11.45 "                       | 99.4                           | 98.6  | 98.8  | 98.6  | 99.3  |
| 12 "                          | 99.0                           | 98.6  | 98.8  | 98.6  | 99.0  |
| 12.15 "                       | 99.0                           | 98.4  | 98.8  | 98.5  | 98.8  |
| 12.30 "                       | 99.0                           | 98.4  | 98.6  | 98.2  | 98.6  |
| 12.45 "                       | 99.0                           | 98.4  | 98.6  | 98.2  | 98.6  |
| 1 "                           | 98.9                           | 98.4  | 98.6  | 98.0  | 98.6  |
| 1.15 "                        | 98.9                           | 98.3  | 98.6  | 98.2  | 98.6  |
| 1.30 "                        | 98.9                           | 98.3  | 98.6  | 98.0  | 98.6  |
| 1.45 "                        | 98.9                           | 98.3  | 98.6  | 98.0  | 98.6  |
| 2 "                           | 98.8                           | 98.3  | 98.6  | 97.7  | 98.6  |
| Mean of the period            | 99.05                          | 98.45 | 98.75 | 98.35 | 98.84 |
| Period from 2 to 10 P.M.      |                                |       |       |       |       |
| 3 o'clock                     | 99.4                           | 99.0  | 98.8  | 98.4  | 98.6  |
| 4 "                           | 99.2                           | 99.5  | 99.6  | 99.2  | 98.8  |
| 6 "                           | 99.6                           | 99.4  | 100.6 | 99.8  | 100.4 |
| 8 "                           | 99.4                           | 99.0  | 100.8 | 100.6 | 101.0 |
| 10 "                          | 99.8                           | 98.6  | 100.6 | 98.8  | 99.0  |
| Mean of the period            | 99.2                           | 99.1  | 100.1 | 99.28 | 99.56 |

These observations will now be considered under the three following heads :—

- 1st. The mean temperature of the day.
- 2nd. The mean temperature of the periods.
- 3rd. The range of the thermometer from 11 to 2 o'clock ; *i. e.* the difference between the 11 o'clock and the 2 o'clock temperatures.



1. *Mean Temperature of the fourteen hours when the man was under observation.*

144 observations in the water days give a mean daily temperature in the axilla of  $97^{\circ}\cdot9$ , and 137 observations in the brandy days give a mean daily temperature of  $97^{\circ}\cdot71$ . In the rectum the observations were 144 and 138 respectively, giving a mean daily rectum temperature of  $98^{\circ}\cdot89$  in the non-brandied and  $98^{\circ}\cdot78$  in the brandied days.

This difference is so slight as to fall within the range of unavoidable error; but it might be that the effect of the brandy was only perceptible for a short time. It is necessary then to take the temperature of the periods.

2. *Mean Temperature of the Periods.*

|                                   | Mean axilla temperature. |                     |
|-----------------------------------|--------------------------|---------------------|
|                                   | Before brandy.           | During brandy.      |
| Period from 6 A.M. to 11 A.M. ... | $97^{\circ}\cdot82$      | $97^{\circ}\cdot73$ |
| No. of observations giving mean   | 66                       | 55                  |
| Period from 11 A.M. to 2 P.M. ... | $97^{\circ}\cdot79$      | $97^{\circ}\cdot58$ |
| No. of observations giving mean   | 49                       | 57                  |
| Period from 2 P.M. to 10 P.M. ... | $98^{\circ}\cdot25$      | $98^{\circ}\cdot05$ |
| No. of observations giving mean   | 29                       | 25                  |

|                                   | Mean rectum temperature. |                     |
|-----------------------------------|--------------------------|---------------------|
|                                   | Before brandy.           | During brandy.      |
| Period from 6 A.M. to 11 A.M. ... | $98^{\circ}\cdot63$      | $98^{\circ}\cdot57$ |
| No. of observations giving mean   | 66                       | 55                  |
| Period from 11 A.M. to 2 P.M. ... | $98^{\circ}\cdot73$      | $98^{\circ}\cdot68$ |
| No. of observations giving mean   | 49                       | 58                  |
| Period from 2 P.M. to 10 P.M. ... | $99^{\circ}\cdot73$      | $99^{\circ}\cdot46$ |
| No. of observations giving mean   | 29                       | 25                  |

The differences, especially in the case of the rectum mean temperatures, are slight even in the hours between 11 and 2. In every case, however, the mean of the thermometer is lower, though to a very slight extent, in the alcoholic series. This, however, is not conclusive, as will be evident from a consideration of the mean rectum temperatures on the several days.



Mean Temperature of Rectum in the three hours following brandy.

| No Brandy. |       | Brandy. |       |
|------------|-------|---------|-------|
| 1st day    | 98.96 | 1st day | 99.05 |
| 2nd "      | 98.80 | 2nd "   | 98.55 |
| 3rd "      | 98.88 | 3rd "   | 98.75 |
| 4th "      | 98.74 | 4th "   | 98.34 |
| 5th "      | 98.60 | 5th "   | 98.84 |
| 6th "      | 98.56 |         |       |

On four of the brandy days the mean temperatures were quite equal to four of the non-brandy days; on one day (6 ounces of brandy) the mean was, however, only  $98^{\circ}34$ , or  $0^{\circ}22$  below the lowest temperature of a water day. But this was accidental, and was owing to the thermometer getting imbedded in a mass of fæces, which separated it from the intestinal wall. For fear of spoiling the experiment, the man would not move though he greatly wished to do so. That this was the real cause of the diminution in this mean, is shown by the last day's experiment, when with the same quantity of brandy the temperature was higher than on four of the water days, and was  $0^{\circ}1$  above the mean of the six water days. It seems therefore very difficult to conclude from the mean rectum temperature of the period that there was an actual fall.

In the period from 2 to 10 the mean brandy temperature was  $0^{\circ}27$  lower than in the water period. But as the observations were much fewer at this time and were taken at much longer intervals, and as food and exercise complicated the results, little importance can be attached to them.

Although the mean temperatures do not, then, give a satisfactory answer to the inquiry, it may be that an effect may be found in the initial and terminal temperatures of the 11 to 2 period. This is shown in the following Table:—

3. *Range of the Temperature from 11 to 2 o'clock.*

Axilla Temperatures.

| Temperature.         | Water Period. Days. |      |      |      |      |      | Brandy Period. Days. |      |      |      |      |
|----------------------|---------------------|------|------|------|------|------|----------------------|------|------|------|------|
|                      | 1.                  | 2.   | 3.   | 4.   | 5.   | 6.   | 1.                   | 2.   | 3.   | 4.   | 5.   |
| At 11 o'clock ...    | 98.2                | 97.6 | 98.2 | 98.0 | 98.2 | 97.8 | 98.2                 | 98.0 | 98.0 | 98.2 | 98.4 |
| At 2 o'clock ...     | 97.6                | 98.2 | 97.8 | 97.8 | 97.7 | 97.2 | 97.8                 | 97.5 | 97.8 | 97.0 | 97.4 |
| Difference .....     | -.6                 | +.6  | -.4  | -.2  | -.5  | -.6  | -.4                  | -.5  | -.2  | -1.2 | -1.0 |
| Rectum Temperatures. |                     |      |      |      |      |      |                      |      |      |      |      |
| At 11 o'clock ...    | 98.4                | 98.8 | 98.4 | 98.8 | 98.8 | 98.8 | 98.8                 | 98.8 | 98.7 | 99.0 | 99.2 |
| At 2 o'clock ...     | 98.8                | 99.0 | 98.8 | 98.4 | 98.5 | 98.2 | 98.8                 | 98.3 | 98.6 | 97.7 | 98.6 |
| Difference .....     | +.4                 | +.2  | +.4  | -.4  | -.3  | -.6  | ...                  | -.5  | -.1  | -1.3 | -.6  |



The greatest fall in these three hours of the axilla temperature on a water day was  $0^{\circ}\cdot6$  Fahr.: the greatest fall on a brandy day was  $1^{\circ}\cdot2$ , and on another day the fall was  $1^{\circ}$ , or  $\cdot6$  and  $\cdot4$  more than on any water day; yet on the third day of brandy, when four fluid ounces (=2 fluid ounces of absolute alcohol) were taken, the difference was only  $0^{\circ}\cdot2$  Fahr.

In considering the rectum temperatures it is necessary to omit the fourth day of brandy, when impacted faecal matter in the bowel evidently lowered the reading of the thermometer. There was no fall with one fluid ounce of brandy ( $=\frac{1}{2}$  fluid ounce or 14 cub. centim. of alcohol), a fall of  $0^{\circ}\cdot5$  with two fluid ounces ( $=28\cdot4$  cub. centims. of alcohol), of only  $0^{\circ}\cdot1$  with four fluid ounces, and of  $0^{\circ}\cdot6$  with six fluid ounces. There was therefore no regularity with the increasing quantity of brandy. The greatest fall ( $0^{\circ}\cdot6$ ) was not more than occurred on one of the water days.

When these numbers, omitting the fourth brandy day of the rectum series, are submitted to calculation according to the rule given by Mr. Galloway in his *Treatise on Probability*, the following results are given:—

Difference of Temperature between 11 and 2 o'clock in Fahrenheit degrees.

|                           | Axilla temperature.                          |  | Rectum temperature.                        |  |
|---------------------------|--|--|--|--|
|                           | Water days.                                  | Brandy days.                                 | Water days.                                | Brandy days.                               |
| No. of observations ..... | 6  | 5  | 6  | 4  |
| Mean difference .....     | $-0^{\circ}\cdot28$                          | $-0^{\circ}\cdot66$                          | $-0^{\circ}\cdot05$                        | $-0^{\circ}\cdot3$                         |
| Probable error of result  | $\pm 0^{\circ}\cdot115$                      | $\pm 0^{\circ}\cdot114$                      | $\pm 0^{\circ}\cdot11$                     | $\pm 0^{\circ}\cdot07$                     |
| Truth lies between ... {  | $-0^{\circ}\cdot395$<br>$-0^{\circ}\cdot175$ | $-0^{\circ}\cdot774$<br>$-0^{\circ}\cdot546$ | $-0^{\circ}\cdot16$<br>$+0^{\circ}\cdot06$ | $-0^{\circ}\cdot37$<br>$-0^{\circ}\cdot23$ |

If the observations are not too few to be trusted, this calculation shows that there was a slight fall in temperature in the three hours following brandy.

But it will be seen at once both how small the fall is, and how difficult it is even yet to feel quite sure of the result. Taking the rectum temperature for example, the probable errors of result as calculated out are  $0^{\circ}\cdot11$  in the water and  $0^{\circ}\cdot07$  in the brandy days; the results in each series might then have been a mean fall of  $-0^{\circ}\cdot16$  in the water series and of  $-0^{\circ}\cdot23$  in the brandy series, or there might have only been a difference of  $-0^{\circ}\cdot07$ .

Still, looking at all these results, and especially to the fact that the calculation is in all cases a little against the brandy series, it may be concluded that in this man the brandy did produce a very slight fall; but that, if this is correct, the fall could not have been more than  $0^{\circ}\cdot35$  Fahr., and may have been only  $\cdot07$  Fahr., in three hours.



It may probably be interesting to note the usual course of the bodily temperature in the water period. It was very uniform: at 6 A.M. (twelve hours after food) the mean rectal temperature was lowest, viz.  $98^{\circ}$ ; and it was highest at 10 at night, when it reached  $100^{\circ}\cdot14$ , or a difference in the twenty-four hours of  $2^{\circ}\cdot14$  Fahr.

From the effect produced by the breakfast, I infer that this course was chiefly owing to food, and not to any peculiar effect produced by the time of day.

Thus the mean rectum temperature being  $98^{\circ}$  at 6 and 6.30 o'clock A.M., it rose at 7 (just after a warm breakfast) to  $98^{\circ}\cdot3$ , and continued to rise till 9 o'clock, when it reached  $99^{\circ}$ . It continued at this point until 10 or 10.30, when it began to fall, and at 11 was  $98^{\circ}\cdot66$ , at 1  $98^{\circ}\cdot65$ , and at 2 o'clock  $98^{\circ}\cdot62$ . Then dinner and exercise were taken, and the thermometer went rapidly up, being  $99^{\circ}\cdot08$  at 3 o'clock,  $99^{\circ}\cdot42$  at 4,  $99^{\circ}\cdot83$  at 6,  $100^{\circ}\cdot10$  at 8, and  $100^{\circ}\cdot14$  at 10. It seems fair to attribute this rise especially to the effect of food.

The mean axilla temperature followed exactly the same course, being lowest ( $97^{\circ}\cdot36$ ) at 6 A.M., rising after breakfast, falling again three and three and a half hours after breakfast, and rising immediately after dinner and tea to its highest point,  $98^{\circ}\cdot4$ ; the mean diurnal difference in the axilla temperature was one half that of the rectal, or  $1^{\circ}\cdot04$ \*

#### *The Pulse.*

The pulse was taken on an average twenty-three times daily, from six in the morning until ten at night, the man being always in a recumbent position, and, in fact, being in bed until two o'clock every day. The course of the pulse before the brandy was taken was very constant; the number of beats per minute was raised by breakfast for two hours, then fell gradually until dinner, and then rose greatly after dinner in consequence of the food and exercise.

The following are the averages of the days:—

| Days.                             | Before Brandy. | During Brandy. |
|-----------------------------------|----------------|----------------|
| 1 .....                           | 76'3           | 75'4           |
| 2 .....                           | 79'9           | 73'3           |
| 3 .....                           | 77'0           | 77'2           |
| 4 .....                           | 77'2           | 77'2           |
| 5 .....                           | 72'6           | 73'9           |
| 6 .....                           | 71'8           |                |
| Average of the whole water period |                | 75'67          |
| " " brandy "                      |                | 75'47          |

\* It may be noticed, in reference to the rectum temperature, that it is not quite correct to say, as is sometimes done, that there is no change within short periods. In half an hour the rectum temperature has varied as much as  $0^{\circ}\cdot4$  Fahr., though I took every precaution to place the thermometer properly and to read it with great care. Usually it is much less than this. The variations within short periods in the axilla were, however, decidedly greater than in the rectum, but were seldom more than from  $0^{\circ}\cdot6$  to  $0^{\circ}\cdot8$  as a maximum.



It will be observed that, when all the days are taken, the brandy did not raise the mean pulse of the whole day. It increased, however, the rapidity of the pulse during the three hours after it was taken, as will be seen from the following Table:—

Mean of the hours from 11 to 2 o'clock.

| Days.     | No Brandy. | Brandy. |
|-----------|------------|---------|
| 1 .....   | 67.0       | 69      |
| 2 .....   | 71.6       | 67.7    |
| 3 .....   | 66.9       | 79.8    |
| 4 .....   | 64.8       | 71.1    |
| 5 .....   | 63.0       | 71.1    |
| 6 .....   | 61.0       | —       |
| Mean..... | 65.7       | 71.7    |

The quickening of the pulse during these hours is best seen by taking two days, which are fair samples of the series.

Record of two days, one without and one with brandy (6 ounces), to show the influence of food, of movement, and of brandy.

| Hours.         | Beat of Pulse. |                                  | Hours.<br>(continued). | Beat of Pulse. |                                  |
|----------------|----------------|----------------------------------|------------------------|----------------|----------------------------------|
|                | No Brandy.     | Brandy at 11 o'clock (6 ounces). |                        | No Brandy.     | Brandy at 11 o'clock (6 ounces). |
| 6 A.M.         | 65             | 65                               | 12.15 P.M.             | ...            | 72                               |
| 6.30           | 65             | 65                               | 12.30                  | ...            | 69                               |
| 7 (breakfast)  | 65             | 64                               | 12.45                  | 64             | 69                               |
| 7.30           | 67             | 66                               | 1                      | 62             | 67                               |
| 8              | 84             | 82                               | 1.15                   | 62             | 67                               |
| 8.30           | 85             | 93                               | 1.30                   | 61             | 65                               |
| 9              | 84             | 90                               | 1.45                   | 61             | 65                               |
| 9.30           | 73             | 85                               | 2                      | 60             | 70                               |
| 10             | 66             | 75                               | Mean of period         | 61.6           | 71.25                            |
| 10.30          | 69             | 74                               | 3                      | 98             | 94                               |
| 11             | 68             | 74                               | 4                      | 94             | 98                               |
| Mean of period | 72             | 76                               | 6                      | 92             | 99                               |
| 11.15          | 62             | 76                               | 8                      | 94             | 95                               |
| 11.30          | ...            | 82                               | 10                     | 82             | 88                               |
| 11.45          | 62             | 80                               | Mean of period         | 92             | 95                               |
| 12 (noon)      | 60             | 73                               |                        |                |                                  |

As the means of the entire day are practically the same when all the days are taken, it is clear that the acceleration of the pulse in the three hours succeeding the taking of the brandy must have been compensated by a corresponding lessening of frequency afterwards; and this is shown by the following Table:—



|   | Pulse.                      |                                  |                             |
|---|-----------------------------|----------------------------------|-----------------------------|
|   | Period from<br>6 to 11 A.M. | Period from<br>11 A.M. to 2 P.M. | Period from<br>2 to 10 P.M. |
| Mean of six days, }<br>without brandy }   | 77.2                        | 65.7                             | 88.9                        |
| Mean of five days, }<br>with brandy ... } | 74.2                        | 71.7                             | 87.0                        |

In the brandy period the mean pulse was 1.9 per minute slower in the after part of the day, and three beats per minute slower in the morning. The action of the single small dose of brandy in the day was to alter the mode of working of the heart, and not to alter the amount of work done in 24 hours, as far as this was judged of by the frequency of the pulse. As far as frequency was concerned the compensation was perfect, and the temporary quickening was balanced by an equal amount of subsequent retardation. Previous experiments indicated that when large and repeated doses were taken, the acceleration was not thus compensated, and that the heart beat more frequently than was natural throughout the whole day. It was certainly very interesting to see how this healthy heart maintained its balance, and, in spite of the alteration in action forced upon it, accomplished in the day the same amount of work under different conditions of diet. Whether other healthy, and especially whether diseased, hearts would do the same is an interesting question, as is also the point whether the temporary acceleration was, in this man, useful, or hurtful, or indifferent, to the heart.

#### *Respiration.*

The respirations were taken at the same time as the pulse, and there were twenty-three daily observations. To save space I give only the mean numbers.

#### *Respirations.*

Mean number per minute.

#### *Before Brandy.*

| Period.           | Days, June 1873. |       |      |     |     |     |
|-------------------|------------------|-------|------|-----|-----|-----|
|                   | 21.              | 22.   | 23.  | 24. | 25. | 26. |
| 6 to 11 A.M.      | 23.3             | 24.0  | 20.8 | 21  | 21  | 22  |
| 11 A.M. to 2 P.M. | 21.7             | 23.3  | 19.1 | 19  | 18  | 18  |
| 2 to 10 P.M.      | 24               | 23.25 | 23   | 22  | 23  | 23  |



## During Brandy.

| Period.           | Days, June 27 to July 1, 1873. |      |      |       |      |
|-------------------|--------------------------------|------|------|-------|------|
|                   | 27.                            | 28.  | 29.  | 30.   | 1.   |
| 6 to 11 A.M.      | 21                             | 20   | 20·1 | 21    | 19   |
| 11 A.M. to 2 P.M. | 18·3                           | 17·8 | 20·7 | 16·66 | 15·9 |
| 2 to 10 P.M.      | 22                             | 21   | 21   | 21·4  | 23   |

The respirations in this man were always extremely quick, even when he had been lying in bed for eighteen hours. The variation follows closely the changes in the pulse. They increased after breakfast at 7 o'clock, and then at 9.30 commenced to fall, and continued less numerous by two or three per minute until dinner. This meal, and the exercise which was always taken in the afternoon, raised the number. The brandy seemed to lessen the number of respirations in the period from 11 to 2 o'clock; the mean of this period in the anti-brand days was 19·86 per minute, and in the brandy period was 17·88. This result, if it be real, showed a difference between the pulse and respirations, the former being raised six beats per minute on a mean of all the days, and the latter being lowered two respirations per minute in the three hours following the brandy. The effect on the number of respirations was most marked in the two days when six ounces of brandy was taken.

Considering, however, the rather unusual frequency of the respirations in the man and the smallness of the change, I hesitate to conclude that the respirations were lessened in number, but decidedly they were not increased.

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## II. *Experiments during complete Inanition.*

The following experiments were made to determine the effect of alcohol after sixteen hours fasting:—

A healthy man (J. S.), 5 ft. 4 in. in height, weighing 66·774 kilogrammes, was kept in bed every day until 1 o'clock, at which time he received his first meal in the day. The last meal was taken at 6 o'clock P.M. He was consequently fasting for nineteen hours. The axilla and rectum temperatures were taken every half hour from 6 to 10 A.M., and every fifteen minutes from 10 to 1 P.M., the thermometers remaining *in situ*, except for the purpose of being read. The daily food was the same, except on two days, when the brandy destroyed his appetite and he could not quite eat his ration.



The experiments were carried on for six days: on the first, third, and fifth days he took no alcohol; on the second, fourth, and sixth days he took 6 fluid ounces of brandy, containing 36 per cent. of alcohol, at 10 o'clock; he therefore took 2.16 fluid ounces, or 61 cub. centims., of absolute alcohol sixteen hours after taking food. The following Tables give the results.

## Temperature of Axilla.

| Time.                | Days.  |                           |       |                           |       |                           |
|----------------------|--------|---------------------------|-------|---------------------------|-------|---------------------------|
|                      | 1.     | 2.                        | 3.    | 4.                        | 5.    | 6.                        |
| 6 o'clock A.M....    | .....  | 97.4                      | 96.8  |                           |       |                           |
| 6.30 "               | 98.0   | 97.4                      | 96.8  | 97.0                      | 97.5  | 97.1                      |
| 7 "                  | 97.0   | 97.4                      | 97.0  | 96.6                      | 97.5  | 97.2                      |
| 7.30 "               | 97.4   | 97.4                      | 97.0  | 96.2                      | 97.7  | 97.0                      |
| 8 "                  | 97.0   | 97.3                      | 97.1  | 96.8                      | 97.8  | 97.2                      |
| 8.30 "               | 96.2   | 97.6                      | 97.4  | 97.0                      | 97.4  | 97.1                      |
| 9 "                  | 96.6   | 97.4                      | 97.45 | 96.6                      | 97.2  | 97.2                      |
| 9.30 "               | 97.1   | 97.5                      | 97.2  | 96.8                      | 97.2  | 97.0                      |
| 10 "                 | 96.9   | 97.8                      | 96.7  | 97.2                      | 97.2  | 97.4                      |
| Mean .....           | 97.025 | 97.46                     | 97.05 | 96.77                     | 97.43 | 97.15                     |
|                      |        | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |
| 10.15 o'clock A.M... | 96.2   | 98.0                      | 97.0  | 97.2                      | 97.2  | 96.8                      |
| 10.30 "              | 96.8   | 97.6                      | ..... | 96.6                      | 96.9  | 97.2                      |
| 10.45 "              | 97.0   | 97.6                      | 97.2  | 97.0                      | 97.4  | 97.1                      |
| 11 "                 | 97.8   | 97.75                     | 97.6  | 96.4                      | 97.5  | 97.1                      |
| 11.15 "              | 97.6   | 97.3                      | 97.4  | 96.4                      | 97.2  | 97.1                      |
| 11.30 "              | 97.8   | 97.6                      | 97.4  | 96.4                      | 97.5  | 97.1                      |
| 11.45 "              | 97.7   | 97.6                      | 97.4  | 96.8                      | 97.6  | 97.2                      |
| 12 "                 | 98.4   | 97.5                      | 97.35 | 96.65                     | 97.6  | 97.3                      |
| 12.15 o'clock P.M... | 98.0   | 97.4                      | 97.2  | 96.6                      | 97.4  | 97.05                     |
| 12.30 "              | 97.8   | 97.6                      | 97.7  | 96.6                      | 97.2  | 97.1                      |
| 12.45 "              | 98.3   | 97.6                      | 97.4  | 96.6                      | 97.4  | 97.1                      |
| 1 "                  | 97.6   | 97.6                      | 97.5  | 96.6                      | 97.4  | 97.4                      |
| Mean .....           | 97.58  | 97.59                     | 97.38 | 96.654                    | 97.36 | 97.13                     |
| 2 o'clock P.M.....   | 98.4   | 97.85                     | 98.2  | 97.0                      | 98.4  | 97.0                      |
| 4 "                  | 98.4   | 98.1                      | 98.1  | 97.6                      | 98.6  | 98.0                      |
| 6 "                  | 99.0   | 98.6                      | 98.44 | 98.2                      | 98.6  | 98.4                      |
| 8 "                  | 98.6   | 98.45                     | 97.8  | 98.4                      | 97.8  | 98.0                      |
| 10 "                 | 98.0   | 98.2                      | 96.8  | 97.89                     | 97.4  | 97.4                      |
| Mean .....           | 98.48  | 98.24                     | 97.87 | 97.82                     | 98.16 | 97.84                     |



## Temperature of Rectum.

| Time.                | Days.  |                           |       |                           |       |                           |
|----------------------|--------|---------------------------|-------|---------------------------|-------|---------------------------|
|                      | 1.     | 2.                        | 3.    | 4.                        | 5.    | 6.                        |
| 6 o'clock A.M...     | .....  | 98.4                      | 97.8  |                           |       |                           |
| 6.30 "               | 97.4   | 98.4                      | 97.8  | 97.8                      | 97.9  | 97.9                      |
| 7 "                  | 98.2   | 98.4                      | 98.4  | 97.8                      | 97.9  | 97.9                      |
| 7.30 "               | 98.2   | 98.4                      | 98.4  | 98.0                      | 98.0  | 97.8                      |
| 8 "                  | 98.4   | 98.6                      | 98.4  | 98.0                      | 97.9  | 97.9                      |
| 8.30 "               | 98.4   | 98.6                      | 98.4  | 98.2                      | 98.2  | 97.6                      |
| 9 "                  | 98.4   | 98.4                      | 98.2  | 98.0                      | 98.4  | 97.7                      |
| 9.30 "               | 98.4   | 98.4                      | 98.1  | 98.2                      | 98.3  | 97.9                      |
| 10 "                 | 98.2   | 98.4                      | 98.2  | 98.4                      | 98.4  | 98.1                      |
| Mean .....           | 98.2   | 98.44                     | 98.19 | 98.05                     | 98.12 | 98.1                      |
|                      |        | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |
| 10.15 o'clock A.M... | 98.3   | 98.6                      | 98.2  | 98.25                     | 98.4  | 98.2                      |
| 10.30 "              | 98.4   | 98.5                      | 98.2  | 98.3                      | 98.4  | 98.0                      |
| 10.45 "              | 98.9   | 98.4                      | 98.3  | 98.2                      | 98.4  | 97.9                      |
| 11 "                 | 98.8   | 98.5                      | 98.35 | 97.8                      | 98.3  | 97.6                      |
| 11.15 "              | 99.0   | 98.2                      | 98.2  | 97.5                      | 98.3  | 97.7                      |
| 11.30 "              | 98.9   | 98.2                      | 98.3  | 97.4                      | 98.4  | 97.6                      |
| 11.45 "              | 99.0   | 98.2                      | 98.3  | 97.4                      | 98.4  | 97.6                      |
| 12 o'clock P.M...    | 99.0   | 98.2                      | 98.3  | 97.4                      | 98.4  | 97.6                      |
| 12.15 "              | 99.0   | 98.25                     | 98.3  | 97.4                      | 98.4  | 97.9                      |
| 12.30 "              | 99.0   | 98.3                      | 98.3  | 97.4                      | 98.4  | 97.8                      |
| 12.45 "              | 99.0   | 98.4                      | 98.4  | 97.4                      | 98.4  | 97.8                      |
| 1 "                  | 99.0   | 98.4                      | 98.6  | 97.5                      | 98.4  | 97.8                      |
| Mean .....           | 98.833 | 98.346                    | 98.31 | 97.66                     | 98.38 | 97.8                      |
| 2 o'clock P.M. ....  | 99.8   | 99.4                      | 99.3  | 98.6                      | 99.4  | 98.8                      |
| 4 "                  | 100.2  | 98.7                      | 99.3  | 98.2                      | 99.6  | 98.8                      |
| 6 "                  | 99.6   | 99.4                      | 99.8  | 99.2                      | 99.8  | 100.0                     |
| 8 "                  | 99.8   | 99.4                      | 99.6  | 99.4                      | 98.8  | 99.4                      |
| 10 "                 | 99.0   | 99.2                      | 98.4  | 98.8                      | 98.6  | 98.4                      |
| Mean .....           | 99.68  | 99.22                     | 99.28 | 98.84                     | 99.24 | 99.08                     |

If the rectum temperatures, as being the safest, are alone regarded, the following are the mean daily temperatures:—

|                              | Days. |                           |       |                           |       |                           |
|------------------------------|-------|---------------------------|-------|---------------------------|-------|---------------------------|
|                              | 1.    | 2.                        | 3.    | 4.                        | 5.    | 6.                        |
|                              |       | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |       | 6 ounces<br>of<br>brandy. |
| Mean rectum<br>temperature } | 98.8  | 98.546                    | 98.45 | 98.02                     | 98.47 | 98.14                     |



The mean of the three water days was  $98.57$ , and of the three days with brandy  $98.24$ .

There appears, then, to be a slight fall on the brandy days. On reference to the larger Table giving the means of the periods, it will be also noticed that in the periods from 10 to 1 in the three hours immediately succeeding the brandy, the rectum temperature was not only lower in two of the brandy periods, but sank twenty-six times to  $98^{\circ}.2$  or below it, and on one day sank to  $97^{\circ}.4$  for more than an hour; while in the corresponding periods without brandy, which include an equal number of observations, it only sank three times as low as  $98^{\circ}.2$ , and never fell below this. In other words, out of nine hours when brandy was taken, the temperature was at  $98^{\circ}.2$ , or below it, during  $5\frac{3}{4}$  hours, while in other 9 hours without brandy, at the same time of the day, the temperature was at  $98^{\circ}.2$  only for  $\frac{3}{4}$  of an hour, and was never lower. This seems conclusive; for whatever conditions, independent of food and movement, may cause slight alterations in temperature (and the Tables show such conditions do act), it seems impossible they should have acted twenty-six times out of thirty-six when alcohol was taken, and only three times out of thirty-six when alcohol was not taken.

On tracing the rectum temperatures on the several days from 6 A.M. to 1 P.M., the fall after alcohol is well marked on the fourth day, and is quite perceptible on the sixth day, while on the second day it is only obvious for an hour, and is not great. The explanation of this want of uniformity may perhaps be that the processes in the body causing variations of temperature may sometimes act in the same direction with alcohol and sometimes in the opposite, or, in other words, may sometimes increase the fall and sometimes counteract it.

With regard to the amount of fall, the lowest rectum temperature on the fourth day, when the effect of alcohol was most marked, was  $97^{\circ}.4$ , while in the hours on the same day before alcohol the lowest was  $97^{\circ}.8$ . If the effect of alcohol is measured by this difference, it amounts to  $0^{\circ}.4$  F.; if it is measured by the difference in the means of the two periods, it amounts to  $0^{\circ}.39$  Fahr. It seems fair to assume that 2.16 fluid ounces, or 61 cub. centims., of absolute alcohol produced a mean depression equal to  $\frac{4}{10}$  of a degree Fahr. during three hours after alcohol was taken.

#### *The Pulse and Respirations.*

The pulse in this man was raised in frequency about five beats per minute by the brandy, as will be seen from the following Table, where the means of the periods only are given to save room.

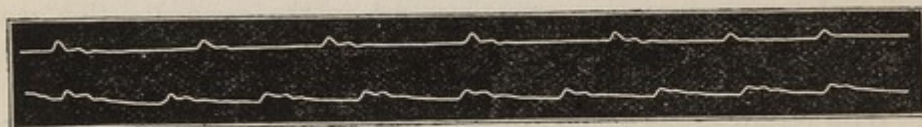


| Mean pulse.  | Days. |                        |       |                       |       |                        |
|--|-------|------------------------|-------|-----------------------|-------|------------------------|
|  | 1.    | 2.<br>Brandy<br>at 10. | 3.    | 4.<br>Brandy<br>at 10 | 5.    | 6.<br>Brandy<br>at 10. |
| From 6 to 10 A.M.,<br>8 observations on<br>each day.....       | 51.25 | 55.88                  | 46.77 | 47.9                  | 47.25 | 48.75                  |
| From 10 A.M. to 1 P.M.,<br>12 observations on<br>each day..... | 53.91 | 59.85                  | 46.1  | 51.91                 | 46.17 | 56.08                  |
| From 1 to 10 P.M.,<br>5 observations on<br>each day.....       | 67.8  | 76                     | 59    | 65.6                  | 66.2  | 70.2                   |

Sphygmographic tracings were taken for me very carefully by Dr. Hewett, Surgeon R.N., every hour; and forty-two were taken in all. I annex a few tracings, which show the increased force of the heart and the relaxations of the arterial coats.

*20th January.*

Tracing at 9.30 A.M., 15½ hours after food, and during rest.  
Pulse 52. Respirations 15.

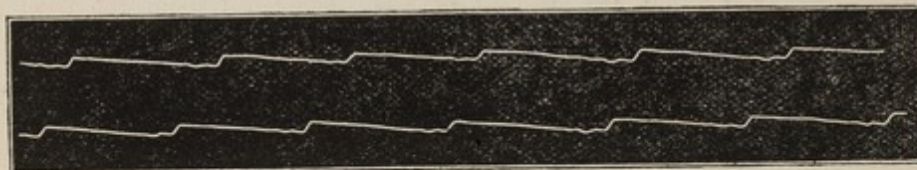


Tracing at 11 A.M. on the same day, during rest, 1 hour after 6 fluid ounces of brandy, 17 hours after food. Pulse 59. Respirations 11.



*22nd January.*

Tracing at 9.30 A.M., 15½ hours after food, and during rest.  
Pulse 49. Respirations 12.

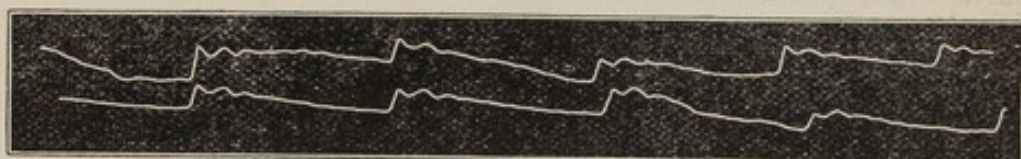




Tracing at 11 A.M. on the same day, 1 hour after 6 fluid ounces of brandy, but with no food for 17 hours. Body at rest. Pulse 58. Respirations 9.



Tracing at 12.30 on the 21st January, 18½ hours after food. No brandy. To show the effect of fasting. Pulse 48. Respirations 11.



The respirations were slightly lessened in number.

#### *General Conclusions.*

I believe the following conclusions may be drawn from the observations formerly recorded (Proceedings of the Royal Society, Nos. 120, 123, and 136) and from those now laid before the Royal Society.

1. When brandy in dietetic doses ( $=2.16$  fluid ounces, or 61 cub. centims., of absolute alcohol) was given to a healthy man fasting and at rest, a decided, though slight lowering, of bodily temperature (as judged of by the heat of the rectum) was caused. The amount of lowering was under  $\frac{1}{2}$  a degree of Fahrenheit; and sometimes even this amount was not perceptible, being probably counteracted by the opposing influence of the heat-producing changes in the body, which cause slight variations of temperature independent of food and movement. The greatest effect was produced from about one to two hours after the alcohol was taken, and the effect was evidently passing off in three hours.

2. When brandy in dietetic doses was given to a healthy man at rest and in whom the process of digestion was completed, and whose temperature raised by the food was again commencing to fall, a lessening of temperature was also proved, but its amount was not so great; it could not have been more than  $0^{\circ}.35$  Fahr., and may have been only  $0^{\circ}.07$  Fahr.

3. When alcohol was given with food, with either usual or increased exercise, no effect on temperature was perceptible, even though the alcohol was given in large quantities, viz. from 4 to 8 fluid ounces of absolute alcohol (114 to 227 cub. centims.) in twenty-four hours. It is to be presumed that the amount of heat generated from the food and movement concealed the effect of the alcohol, which would require a more delicate method or longer observations for detection.

4. In no case did alcohol raise the temperature.

5. The effect of alcohol on the pulse was uniform in the four men experi-



mented upon. The contractions of the heart were more frequent after alcohol during complete rest, from five to ten beats per minute for some time; and when exercise was taken the increase was greater. The mean pulse of the twenty-four hours was, however, not increased unless the amount of alcohol was large and repeated. In other words, the heart's beats were less frequent than natural when the effect of the alcohol had passed off. The pulse became both fuller and softer to the touch; and this relaxation of the radial artery was shown also by the sphygmograph. That the smaller vessels were relaxed, was shown both by the redness of the surface and by the evident ease with which the blood traversed the capillaries, as shown by the sphygmographic tracings.

6. The respirations were not increased in number by alcohol; they were rather lessened, and were deeper in some of the experiments; but the effect was not very marked.



## LECTURE.

Friday, May 23rd, 1862.

MAJOR-GENERAL SIR RICHARD AIREY, K.C.B., Quartermaster-General,  
in the Chair.

### THE VALUE OF A GYMNASTIC TRAINING TO THE SOLDIER.

By ARCHIBALD MACLAREN, Esq.

When it was proposed to me that I should do myself the honour of reading a paper on this subject before the members of this Institution, I for some time hesitated to do so. I hesitated because I felt the difficulty of treating a subject of this importance, and of this extent, with anything like justice in the compass of an ordinary lecture. But, on the other hand, I am so anxious to avail myself of every opportunity of bringing it with passable fairness before all who are interested in the well-being and efficiency of the soldier—I am so conscious that the members of this Institution are of all men the most capable of appreciating and of testing the merits of any scheme claiming to further this object—I am so impressed with the importance of the subject itself—I have had such ample evidence of its value, and, as I believe, I can produce such convincing proofs of the power of the system of bodily training which I advocate to accomplish the object desired—that I hastily overcame my first scruples, and have endeavoured to prepare a short paper, touching, as far as time would admit, on its chief features, feeling sure you will extend to me your indulgence, in consideration of the difficulties I must encounter in any attempt to treat a subject embracing so many details in so brief a space of time.

But before doing so, before bringing to your notice any proofs of the value of the system, before attempting to show the advantages which one form of exercise possesses over another, I would ask your attention to some remarks, perhaps not very easy to follow, on account of the brevity with which it has been necessary to treat them, on the nature of exercise; I mean exercise in its abstract sense, whether taken for amusement, recreation, or with the avowed purpose of obtaining from it, what it is found by experience to give—strength; in short, I will endeavour to show what exercise is, what it does, and how it does it.

Exercise may be briefly defined as muscular movement. Muscular, because all movements of the body are executed by the muscles. It is by the action of the muscles, separately or in concert, that our every move-



ment, great or small, from the lifting of a finger to the most powerful effort of which the human body is capable, is performed; the power of executing such movements being always in proportion to the contractility, or, in other words, to the strength, of the muscles employed, evidenced externally by their development.

Now, it is an unerring natural law, that wherever the blood, which is the source of nourishment to the entire body, is circulated in the most abundant quantity, there will be the greatest development; and, by an equally unerring law, the quantity of blood circulating through each part is chiefly regulated by its exercise. Will you allow me to repeat this passage, it is so very important? "Wherever the blood, which is the source of nourishment to the entire body, is circulated in the most abundant quantity, there will be the greatest development—and the quantity of blood circulating through each part is chiefly regulated by its exercise." In other words, the development of the body, or of any part of the body, will be in relation to its activity, because the circulation of the blood in that part is in relation to its activity. The results of this law are familiar to us all in the fact that every one of the four hundred voluntary muscles of the human body will develop, will increase in size, strength, and dexterity, exactly in proportion as it is called into action. Whatever muscles of the body are called most frequently into action, whatever muscles of the body are most frequently exercised, will be found to be proportionately the largest, the strongest, and the most dexterous. For the present purpose we will view this as the first object of exercise—to increase the power and dexterity of the voluntary muscles of the body.

But in addition to these muscles which perform the various movements which we desire, and which are placed for the most part on the external surface of the body, forming the walls of the upper and lower cavities of the trunk, and constituting the principal bulk of the limbs, there is another class, small in number, and for the most part contained within the cavities of the body, over which we can exercise little or no control—muscles chiefly employed in the processes of digestion, circulation, and respiration, and called involuntary muscles. As I have said, and as their name implies, over these we can exercise no control, but they are equally susceptible with the voluntary muscles of improvement by exercise. For, although the movements constituting the exercise are performed by the voluntary muscles, the impetus given to the circulation in these parts is shared in a greater or a less degree by the rest of the body. We are all familiar with the increased warmth and pleasurable energy felt during and for some time after exercise, where it has not been too violent or too long protracted; this is caused by the greater rapidity with which the blood is circulating throughout the body; and the involuntary muscles are also stimulated by it to activity, evidenced by the increased and energetic beating of the heart and quickened and more powerful respiration. So that, although the exercise be executed by the action of the voluntary muscles alone, yet the health and vigour and capacity of every organ of the entire body will be with them proportionately increased. And thus we may view as accomplished the second object of exercise—to strengthen and develop the all-important organs on which not health only, but life itself, depends.



But there is another advantage of the greatest importance accomplished by exercise—accomplished by the energetic action of the voluntary muscles—I mean the effect of exercise on the condition of the blood itself, from which, as I have said, the whole body receives its nourishment. In every breath we breathe, whether asleep or awake, in sickness or in health, a double process is performed within our lungs—a double process acting directly on the blood at the moment of its passage through them. First, the blood which, as I may say, has made the circuit of the body, having parted with its nourishing and revivifying properties during the first half of its journey, and returned loaded with the waste and effete particles which it has received on its backward course, meets with the air inspired, and to this air it imparts, to this air it resigns, by this air it is relieved of, the load of waste material, principally in the form of carbonic acid gas, a gas which is itself a deadly poison, and the accumulation of which in the blood is productive of innumerable evils. This is one part of the process which takes place in the lungs during the act of breathing, namely, the setting free from the blood of the impurities with which it is charged; the second part is the absorption from the newly inspired air of a relative quantity of oxygen, which is as valuable, as necessary to life, as the carbonic acid is inimical to it. Now, as every one is aware, the direct and immediate effect of exercise is to quicken respiration, and not only to quicken it, that is, to make the separate inspirations and expirations follow each other with greater rapidity, but to make each separate breath of air larger in quantity. What is the direct effect of this accelerated speed and increased volume of the air respired? The blood is more perfectly aerated, is more abundantly supplied with oxygen, more freely and effectually relieved of its carbonic acid. And more than this. The lungs are but one of several organs whose office is to relieve the blood of all matters which might prove injurious to the health of the body, and these organs are all equally stimulated to increased activity by exercise, and receive from it equal permanent benefit.

At what point have we now arrived? First, we have seen that the development of the muscular system depends upon exercise. Secondly, that the health and strength of the vital organs also depend upon exercise. Thirdly, that the purity and nutritive condition of the blood, from which the whole body is nourished, also depend upon exercise; and that these various processes all tend to produce the same results, namely, the health and strength of the body.

I have said that development is in relation to activity, and that strength is, *cæteris paribus*, in relation to development, and this is the key to all physical improvement. We have but to ascertain what part of the body is the weakest, and by giving it suitable exercise we can strengthen it. We have but to ascertain what part of the body has received the smallest share of employment, and consequently the least nourishment, and consequently again has attained the smallest development, and instant means can be taken to remedy the evil, to increase its size and capacity, to improve its conformation, and place it on an equality with the rest of the body.

These being the sure results of exercise, it becomes a matter of the gravest importance to consider what forms of exercise are in themselves the most valuable. It is here, therefore, that I would now desire to direct



#### 4 THE VALUE OF A GYMNASIAC TRAINING TO THE SOLDIER.

your attention to the distinction between purely recreative exercise and systematised exercise or gymnastics; I mean, between exercise which is taken for the amusement, the interest, the pleasure, which some game, sport, or pastime affords, and that which is taken for the sole purpose of the training and strength which it gives. Now, although recreative exercises do undoubtedly give strength also—health and strength to both mind and body—and earnestly as I would recommend that they should have every facility provided for their practice, and should be encouraged by every available means and every suggestive expedient—still it must never be forgotten that not one of these has for its object to develop the body, to give to it, or to any part of it, health and strength. So far from the weakest parts of the body receiving special culture on account of their weakness in recreative exercises, it is just the contrary; the parts of the body chosen to execute the movements of the game are those which can do them best, those in fact which are already the strongest and most dexterous. Not one of them is sufficient to accomplish the perfect development of the body, to bring it to that point of strength, dexterity, and power of endurance to which it is capable of attaining; and to expect this from them, is to expect what they were never designed to give. To accomplish this requires exercise of another kind—exercise prepared upon a clear comprehension of what is required, and how the thing required is to be obtained. It must be exercise for its own sake, exercise for the distinct purpose of the culture of the body. And this is the place claimed by gymnastics, these are the objects which they can accomplish. While I claim for their practice, if the gymnasium be in the hands of a competent superintendent and his instructors be properly qualified men, as high and as intelligent an interest, as great amusement and pleasure, as in any purely recreative exercise, the attainment of bodily health and strength is the one thing aimed at. I claim for the system that I advocate, that, no matter what may be the state of a man's health at the time he begins his work, if he be as weak as a child in the nurse's arms, or the most powerful athlete in his regiment, the exercises of the gymnasium can be regulated to his power—can enable the weak to begin without danger, without disappointment, without any risk of failure that could wound his *amour propre*, or lower him in the eyes of his comrades, but, on the contrary, will afford him a fair starting-point from which he can daily, hourly, lesson by lesson, add to his little store of strength, until he stands abreast with his fellows. And to the powerful man it affords the opportunity of showing his strength, of sustaining his strength, of preserving it intact, serviceable and disposable at any moment for the exigencies of his profession.

I arrive now at the important question, that question to which all the foregoing is but introductory, Does this apply to the position of the soldier? To put it more directly, Do the duties of the soldier yield that abundant physical employment which ensures the full development of his bodily powers? and do the exigencies of his profession require or render valuable the possession of great physical resources?

It will be conceded that the men who fill the ranks of our army are drawn from almost every species of trade, occupation, and calling, and embrace almost every grade of physical power;—massive, powerful men



from the farm, the quarry, the forge, the warehouse and the wharf, and slight, half-formed, half-fed youths from the factory, the shop counter, the desk, and from the innumerable petty trades in which men find employment in closely populated districts. I believe it may be roundly stated that every occupation followed in this country is represented in the army; and, Gentlemen, if what I have stated regarding exercise and its results be correct—and it is founded on the clear and accepted laws which govern our growth and development—to state that every form of occupation in this country is represented in the army, is virtually to state that every form of growth and development is represented there also. (I mean of course within those limitations observed in the enlistment of recruits and subsequent medical examinations). Now, most of the occupations in which artisans and labourers are engaged give powerful and active employment to certain parts of the body, the other parts receiving comparatively little; and the inevitable result of this unequal employment is unequal development, because power is in relation to activity. The parts that have been actively employed will be shapely and strong; the inactive, neglected parts will be weak and stunted. And this will be evident to every eye that knows what proportions to look for; the nature of the employment leaves its mark upon the man for good or for evil—a sign, a seal in witness of his strength and beauty, or a brand denoting his weakness and deformity—fashions him, moulds him for shapelessness or distortion so unerringly, that to the experienced eye the nature of the craft or calling is instantly revealed; or, the occupation being known, you may tell before looking at the man the condition and the direction of his development.

This is the material out of which the soldier is to be formed; rather, let me say, these are the men to whom is to be taught the profession of arms, than which there is none more noble; there can be none so noble, since in the keeping of the soldier, confided to his care, entrusted to his guardianship, are the prosperity, the safety, the honour of the country.

In men drawn from so wide a field will be found every gradation of physical strength, the strongest and the weakest. To take the two extremes for illustration, and to begin with the man of large stature and powerful frame; how has he acquired his powerful frame? Chiefly by energetic and powerful exercise. Other things may have contributed, indeed must have contributed, such as abundant diet, and probably fresh air; but neither of these, nor both of these, nor all the other agents of health put together, will give muscular power without muscular employment. Now remove such a man suddenly from his employment, take him to the dépôt to be straightened and taught to march with his head upright, his arms close in by his sides, and the trunk of his body held erect and motionless as a pillar, and what are you doing? That which is suitable and necessary to enable the man to take his place in the ranks as a soldier, but nothing whatever to sustain, far less augment, his bodily energies. The constrained position, the restricted and closely localized movements of parade and drill, all deny to the trunk of the body and the upper limbs any exercise whatever, any share whatever of that which has given them the strength which they possess, for a continuation of which they are pining, without which they must dwindle to the loss of their shape and size



and power, and the still more important loss to other parts of the body, depending for their health and activity upon the health and activity of these.

But there is another condition of large stature and rapid growth which I would desire to instance; I mean the man of large frame with little strength, the results usually of a strong and unsubduable germ of growth in the individual, which, with adequate diet and suitable and abundant exercise, produces those splendid specimens of men whom we are fain to view as the type of our race, but who, with an inadequate or irregular supply of these agents during the period of their upward growth, attain the bulk of frame, but miss the soundness of constitution and the physical energies which should accompany it. There are many of these men in the army—there must ever be many of these men in the army. We have only to think for a moment of the insufficiency of diet alone, insufficiency in quantity and quality, at a time when abundance was a necessity to either present or prospective health or strength, to know that we have got the *shell* of the man only. Sound, strong, or lasting, he cannot be, because in him we have distributed over a large surface that which is only adequate for a small one. Is it possible yet to restore him to the place he was designed to occupy, designed by the incontrovertible evidence of his stature, attained in spite of his deprivations? Is it possible to give him that soundness of constitution, energy of muscle, elasticity of action, and symmetry of form which were his by birthright? Not possible—not possible to give, after growth is completed, that which should have regulated growth itself, beginning with its beginning, adding to, proportioning, consolidating, and sustaining every cell of every fibre or tissue, as it was added to the frame: but still possible, still feasible, still a certainty, yet to recover a valuable portion of the health and strength, activity and energy of which he has been deprived; still possible to double his material well-being as a man, to double his serviceability as a soldier. At once, the first day he is recognised in the dépôt as an embryo soldier, take him to the gymnasium, prepared, fitted, built for his reception and use; place him under the care of instructors, taught to administer exercise on a clearly defined and comprehensive system, a system calculated to meet the requirements of every learner, weak or strong, to meet the requirements of the whole frame of every learner, and to give to the whole frame suitable and uniform and adequate employment. Do this, and you will create within him a new growth, a new life; a growth for the rectification of all that is wrong, and strengthening of all that is weak; a life within each separate cell, straining for the recovery of that which has been neglected since his birth.

Let us take another instance. The youth who has everything to gain—slight and slim, under-sized and under-fed, who can scarcely be reckoned the raw material out of which a soldier is to be made, but who from his youth, and from that strong germ of physical power which I have learned to look upon as inherent in the frame of every Englishman, is awaiting but the stimulating, quickening, life-giving properties of judiciously regulated exercise to swell and expand into healthy, vigorous existence. What does such a youth gain in drill and parade for the development of his latent resources? He is not twenty yet; capable of receiving vast additions to his physical powers. This is the case with Oxford men, who from their childhood have been living in that state of mental and physical



employment most favourable and most directly conducive to timely development. They seldom attain to their full bodily powers before their twenty-third year. But the youth of the nature I am instancing will be found to be greatly in arrears at all points. What is there in his professional duties to supply the want? So little, so very little, in comparison with his great requirements and almost unlimited capacity for improvement; and that little so partially and so unequally administered, that even its value is reduced. For observe, he cannot attend a parade, walk to a rifle-range, cross a barrack-yard, or ascend a barrack-square, without giving employment to the muscles of his lower limbs, although such employment be altogether inadequate to produce their full development; but it is abundant in comparison to what the upper limbs and trunk receive. These must languish, these must remain relatively feeble, because they are kept without employment, and power is in relation to activity.

It is this inadequacy, this partiality of exercise employed without reference to this law, which render gymnastics or systematised exercise so valuable, for by it only can employment, suitable in nature, degree, and duration, for every part of the body, be provided—and, while the comprehension of this law teaches us how to look for partial developments, and defective and imperfect growth, it has but to be ascertained what these local wants are, what parts of the body are relatively weaker than the remainder, and such employment can be furnished as will raise any such part to the rank of the rest of the body in strength and in serviceability. And, where the entire body is below the point of power to which it should have attained, suitable employment can be furnished for every part, for the whole collectively—employment that can be increased and intensified with the advancing capacity of the learner. And it must never be forgotten that in developing a limb to its full power and perfect conformation we do that, and, except indirectly, we do nothing more; whereas a glance at the trunk of the body will show that in developing the parts of which it is composed, I might almost say constructed, so numerous are its parts, and so complex is their arrangement, we do that and a great deal more. We not only develop to their normal shape, size, and capacity the important muscles of the trunk, but at the same time, and by the same process, we bring to its perfect shape and size the framework which encases and protects those vital organs, whose health and functional power we have seen to be all important. The health of these organs, and their power of performing their functions with due completeness, are essentially dependent upon their perfect freedom; and this freedom they cannot have, if confined and restricted by the narrowness, or other deviation from the natural shape and size, of this enclosing framework; they cannot attain to their full size and power if thus fettered, and no activity on their part can do other than aggravate the evil of their confinement. In thus providing, therefore, for their freedom in functional activity by the expansion of the chamber in which they lie, we directly aid in their development, directly increase their power.

But can I prove, can I adduce any evidence, that the system of bodily training which I advocate would meet the end desired, would adjust and regulate and place under his control the entire available resources of the strong, would sustain and add to his strength and increase his professional



serviceability—that it would take up the comparatively unformed, undeveloped, and altogether negative, frame of the young recruit, and cultivate him into an energetic, active, and strong man? I have no hesitation whatever in saying that it will do both of these, and I believe I can give sufficient evidence that I do not over-estimate its power.

Many years ago I instituted in my gymnasium at Oxford a series of measurements, by which I could ascertain the state of the development of all pupils at the commencement of their instruction, and, these measurements being repeated at given intervals, I could know the rate of their advancement. The revelations made by this system of periodic measurements have been such, as to sustain me in devoting my entire energies to the completion and extension of my system of exercise. I find that to all, child or adult, weak or strong, it gives an impulse, a momentum to the development of his resources, which nothing else can give;—and which nothing can take away, because it is not a thing acquired, a mere mental or physical acquisition; it is the man altered, the man improved, the man brought nearer to the state he was designed to hold by the nature of his organization.\*

But the question will naturally present itself, Would the same results be obtained from a similar system of bodily exercise by the men who fill the ranks of our Army as by the youths passing through our Universities? I think the statements which I have now to make, will satisfactorily answer this question.

The first detachment of non-commissioned officers, twelve in number, sent to me to qualify as instructors, were selected from all branches of the service. They ranged between nineteen and twenty-nine years of age—between five feet five inches and six feet in height—between nine stone two pounds and twelve stone six pounds in weight—and had seen from two to twelve years of service. I confess I felt greatly discomfited at the appearance of this detachment, so different in every physical attribute; I perceived the difficulty, the very great difficulty, of working them in the same squad at the same exercises, and the unfitness of some of them for a duty so special as the introduction of a new system of bodily training into the army—a system in which I have found it necessary to lay down as an absolute rule, that every exercise in every lesson shall be executed in its perfect form by the instructor, previous to the attempt of the learner; knowing from experience how important is example in the acquisition of all physical movements, and how widely the exercises might miss of their object if unworthily represented by an inferior instructor. But I also saw, that the detachment presented perhaps as fair a sample of the Army as it was possible to obtain in the same number of men, and that if I closely observed the results of the system upon these men, the weak and the strong, the short and the tall, the robust and the delicate, I should be furnished with a fair idea of what would be the results of the system upon the Army at large.

I therefore received the detachment just as it stood, and, following my method of periodic measurements, I carefully ascertained and registered

\* A few of these results I have made known in a paper read by me at the meeting of the British Association at Oxford two years ago, and since published in "Macmillan's Magazine," Nov. 1860.—A. M.



the developments of each at the commencement of his course of instruction, and at certain intervals throughout its progress. A tabular statement\* of these measurements will appear, I believe, in the forthcoming blue book, as they were furnished by me to Dr. Logan, the Inspector-General of Hospitals, with whom I have had the pleasure to be associated on the Committee appointed to consider the question of the introduction of these exercises into the Army; but I may here mention that the effects were beyond my most sanguine hopes, and equal to any precedent among the youths in those higher positions of life among whom my observations had been hitherto chiefly made. The muscular additions to the arms and shoulders and the expansion of the chest were so great as to have absolutely a ludicrous and embarrassing result, for before the fourth month several of the men could not get into their uniforms, jackets and tunics, without assistance, and when they had got them on they could not get them to meet down the middle by a hand's breadth. In a month more they could not get into them at all, and new clothing had to be procured, pending the arrival of which the men had to go to and from the gymnasium in their great coats. One of these men had gained five inches in actual girth of chest.

Now, who shall tell the value of these five inches of chest—five inches of additional space for the heart and lungs to work in? There is no computing its value, no power of computing it at all; and, before such an addition as this could be made to this part of the body, the whole frame must have received a proportionate gain. For the exercises of the system are addressed to the whole body, and to the whole body equally, and before this addition could be made to the chest every spot and point of the frame that you could touch with the tip of your finger must be improved also; every organ within the body must be proportionately strengthened.

But I tried another method of recording the results of the exercises. I had these men photographed naked to the waist shortly after the beginning of the course and again at its close; and the change in all, even in these small portraits, is very distinct, and most notably so in the youngest, a youth of nineteen, and, as I had anticipated in him, not merely in the acquisition of muscle, but in a readjustment and expansion of the osseous framework upon which the muscles are distributed.

But there was one change—the greatest of all, and to which all other changes are but means to an end, are but evidences more or less distinct that this end has been accomplished—a change which I could not record, which can never be recorded, but which was to me, and to all who had ever seen the men, most impressively evident—and that was the change in bodily activity, dexterity, presence of mind, and endurance of fatigue; a change, gentlemen, a hundredfold more impressive than anything the tape measure or the weighing chair can ever reveal.

The results upon the second detachment of instructors whom I am now qualifying are equally satisfactory, but more uniform, the men having been more specially selected.

Up to this point, gentlemen, I have spoken but of the beneficial results of exercise as affecting the man, without special reference to his profes-

\* See table in Appendix.—Ed.



sional duties as a soldier; and I have done so purposely, because you will in a moment see that the power of the man and the serviceability of the soldier are inseparable conditions. Our embodied idea of energy, activity, and strength is the soldier, these qualities trained to, made subservient to, the exigencies of his profession; and these qualities are the inevitable results, the incontrovertible results, of that system of bodily training which I advocate, because the system itself is based upon, and all its directions are in accordance with, the natural laws which govern the growth and development of the human body. Endow a man with these qualities, therefore, and you endow him with the power of overcoming all difficulties against which such qualities can be brought to bear, against all difficulties requiring strength, activity, energy, dexterity, presence of mind, tenacity, and endurance. You cannot limit a high qualification to a single use any more than you can limit the purpose to which a good coin may be applied; it will fetch its value anywhere and in anything. And so will strong muscles and sound lungs—in garrison, in camp, or on campaign, on the march, in the field, in the transport, in the hospital, on any service, in any climate.

But, although we cannot limit the use of a qualification, we can very readily give to it a special direction by special care, and make it more distinctly valuable for special purposes. And this is emphatically the case with the application of the powers acquired by gymnastic training to the duties of the professional life of the soldier. Indeed, as will be seen by the published book of the system, this is the ultimate aim and object of every exercise in it, and this is clearly inculcated and steadily kept before the learner throughout his instruction. And the last course in the system consists exclusively of the practical application to a professional use of all that has gone before, teaching the soldier how to overcome material obstacles of every form, position, and character, surmountable by walk or run or leap or vault or climb, with implements and with arms, singly and self-dependent, or with comrades rendering and receiving mutual assistance.

Therefore the question which I have advanced, "Do the exigencies of a soldier's life require or render valuable the possession of great physical resources?" I will not further answer, because the answer is apparent on the face of the question itself, and the question was only put to emphasize the importance of the subject to which it refers. I feel it would be unbecoming in me further to enlarge upon this subject before professional men, acquainted by life experience with all the forms in which the exigencies of the soldier's profession make daily, hourly claim upon his physical resources, and who know that health and strength are the essence of the soldier's power.

Nor need I repeat here, because they must be familiar to you all, the startling statistics which show the small per-centage of men who fall by the weapons of the enemy, in comparison to those who succumb to the demands made upon their bodily energies. For the one enemy in his own form which the soldier has to encounter, there are a hundred lurking around him unseen, in the form of sufferings which originate in the manifold trials of his professional life. He cannot stand the heat, or he cannot stand the cold; he cannot stand the



terrible exertion and excitement of the struggle, or he cannot stand the monotony of the camp and wearisomeness of the march; he cannot subsist on the scanty and ill-prepared rations; he cannot bear up against the broken and insufficient rest. Against his single human foe we put into his hands the most perfect weapon invented—I might almost say inventable—by man; against the other foes that lurk in his path, awaiting him at every turn, there is but one protection—to strengthen the soldier himself.

In conclusion, I would merely remark, that while this is applicable to the soldiers of every country, how much more so—with how much greater force—does it apply to our own, who have to pass from station to station over the whole world, who have to endure the extremes of every climate, from the almost arctic cold of Canada to the tropical heat of Africa and the Indies? If physical energy and constitutional strength be the essence of power in the soldiers of any other nation, they must be so with strange distinctness in those of ours, who have to exercise their profession over almost every country on the face of the globe, and to endure the hardships, the fatigues, the discomforts of them all.

In this paper I have spoken only of the physical advantages which the soldier would derive from a systematic bodily training, but its value in a moral point of view would be almost as great, as evident, and would be assured by the natural action of laws as plain as those which regulate his material improvement. I do not allude merely to the filling up healthfully, pleasurably, and profitably of his spare time—I do not allude merely to the evidence which it would set before him of how health and strength are gained, and how they are lost, and of the immeasurable advantages which the possessor of these qualities has, in every situation of life, over the man who has them not—I allude to the well-known physiological fact, that active bodily exercise has the direct effect of checking that desire for stimulants and excitements and sensuous indulgences, which sap and undermine the constitution, and waste and wear out the soldier's frame, and which arises, not so much from any physical want, or for the natural gratification of any legitimate physical desire, as from a nervous irritability and craving, that become the stronger the more they are indulged, and the strength and force of which are usually in an inverse ratio to the bodily strength and power of the individual—in an inverse ratio to his ability to indulge in them with impunity.

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## APPENDIX.

The Gymnasium, Oxford,  
April 26th, 1861.

DEAR DR. LOGAN,—You expressed so much interest in the report which I sent you some time ago on the progress made by the men whom I am qualifying as gymnastic instructors, that I am induced to send you a second, showing the ultimate results of their course of instruction, for they return to Aldershot to-morrow.

Had I, in this first attempt to introduce gymnastic exercises into the Army, been desirous merely of producing a number of athletes, I should have requested the exchange of some of the men; but I considered that I



should be more correctly interpreting the wishes of his Royal Highness in accepting whatever men were sent to me, and thus testing the value of the system by its effects upon men of widely different degrees of physical power, stature, age, and constitution. For this reason also I have not restricted my tests to the ordinary course of measurements instituted in my school ; in the first week of their instruction I had a photograph of each man taken in a position to show the state of the muscular development of the upper limbs and the general conformation of the chest ; and in this, their last week, I have had these photographs re-taken, and I think you will consider the results which they manifest of sufficient importance to warrant my thus drawing your attention to them. Here, in Oxford, where I yearly receive large numbers of youths from our public schools, I have been enabled to make extended observations on the results of systematized exercise on their frames and constitutions ; but I confess I was not prepared to find that men in another rank of life, whose early habits and occupations must have been essentially different, were equally capable of physical improvement.

I have arranged the names and portraits according to age, and you will see that from the youngest to the oldest, the first only in his 19th year, and the last in his 29th, and counting twelve years' service, all have made great and general improvement ; those who required it the most having had the greatest gain, for evidence of which I would refer you to No. 9, originally a delicate man, now a comparatively strong one. But it is to the first on the list that I would most particularly desire to direct your attention ; for, as you will see, the physical condition of this young man has been in a few months so materially changed, that, when the features are concealed, one would scarcely imagine that the photographs represented the body of the same individual. I need not say that the alteration must be great to show at all in these small portraits. Moreover, his is the temperament and the nature of body—thin, hard, and spare—that is least susceptible of change and material increase.

If, therefore, I am correct in viewing these men as fairly representing those who fill the ranks of our army, the same good which has been obtained by these may be obtained by all ; and, if the case of the youngest of the detachment represents the condition of the recruit and young soldier, I think I am right in assuming that were this system of bodily training administered to them at the outset of their military service—while with some the upward growth is still going on and with all the lateral development is in full force—not only would their physical powers be doubled for every use to which they could be applied, whether for the overcoming of obstacles by strength and activity, or for the endurance of protracted exertion, fatigue, or privation, but, what you will perhaps agree with me in viewing as a greater good, this vast and permanent expansion of the chest will powerfully aid in resisting or in giving exemption from those forms of disease which specially attend the duties and habits of the soldier.

I remain, dear Dr. Logan,

Yours very faithfully,

ARCHIBALD MACLAREN.

T. G. Logan, Esq., M.D.,  
Inspector-General of Hospitals.



TABULAR STATEMENT OF MEASUREMENTS OF 1ST DETACHMENT  
OF NON-COMMISSIONED OFFICERS SELECTED TO BE QUALIFIED  
AS MILITARY GYMNASRIC INSTRUCTORS.

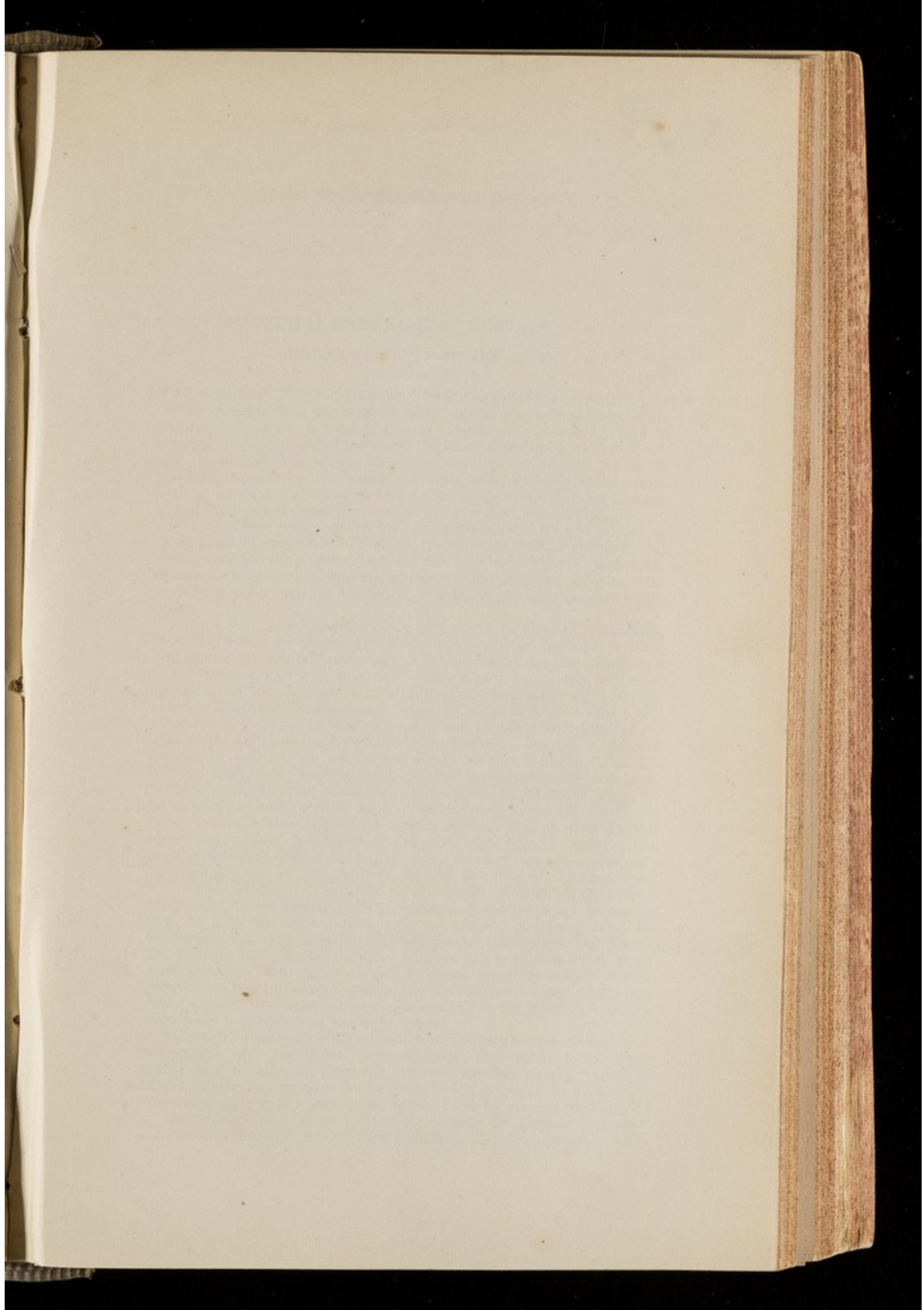
| MEASUREMENTS. |                                |                        |                  |  |                           |                                      |                                      |                                      | INCREASE.                      |                                    |                                    |                                    |                                    |
|---------------|--------------------------------|------------------------|------------------|--|---------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| No.           | Name.                          | Date.                  | Age.             | Height.                                  | Weight.                   | Fore Arm.                            | Upper Arm.                           | Girth of Chest.                      | Height.                        | Weight.                            | Fore Arm.                          | Upper Arm.                         | Girth of Chest.                    |
|               |                                |                        |                  | ft. in.                                  | st. lbs.                  | ins.                                 | ins.                                 | ins.                                 | ins.                           | lbs.                               | ins.                               | ins.                               | ins.                               |
| 1             | Sergeant Smith,<br>55th Foot . | Sept. 11.<br>April 30. | 19               | 5 8 $\frac{1}{2}$<br>5 8 $\frac{1}{2}$   | 9 2<br>10 1               | 9 $\frac{1}{2}$<br>10 $\frac{1}{2}$  | 10<br>11 $\frac{1}{2}$               | 33<br>37 $\frac{1}{2}$               | $\frac{1}{2}$<br>$\frac{1}{2}$ | 13<br>13                           | 1<br>1                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 4 $\frac{1}{2}$<br>4 $\frac{1}{2}$ |
| 2             | " Jackson,<br>49th Foot .      | Sept. 11.<br>April 30. | 21               | 5 9<br>5 9 $\frac{1}{2}$                 | 10 5<br>11 1              | 10<br>11                             | 11<br>12 $\frac{1}{2}$               | 34 $\frac{1}{2}$<br>38 $\frac{1}{2}$ | $\frac{1}{2}$<br>$\frac{1}{2}$ | 10<br>10                           | 1<br>1                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 3 $\frac{1}{2}$<br>3 $\frac{1}{2}$ |
| 3             | " Flannigan,<br>41st Foot .    | Sept. 11.<br>April 30. | 23               | 5 5<br>5 5 $\frac{1}{2}$                 | 9 7<br>10 2               | 10 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 12<br>13 $\frac{1}{2}$               | 34<br>37 $\frac{1}{2}$               | $\frac{1}{2}$<br>$\frac{1}{2}$ | 9<br>9                             | 1<br>1                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 3 $\frac{1}{2}$<br>3 $\frac{1}{2}$ |
| 4             | " Reilly,<br>18th Hussars      | Sept. 11.<br>April 30. | 23               | 5 7 $\frac{1}{2}$<br>5 7 $\frac{1}{2}$   | 9 13<br>10 8              | 10 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 12<br>13                             | 37<br>38 $\frac{1}{2}$               | $\frac{1}{2}$<br>$\frac{1}{2}$ | 9<br>9                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 1<br>1                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ |
| 5             | " Tarbotton,<br>5th Lancers    | Sept. 11.<br>April 30. | 23               | 5 8 $\frac{1}{2}$<br>5 8 $\frac{1}{2}$   | 9 10<br>10 6              | 10<br>10 $\frac{1}{2}$               | 11<br>12                             | 36<br>37                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 10<br>10                           | $\frac{1}{2}$<br>$\frac{1}{2}$     | 1<br>1                             | 1<br>1                             |
| 6             | " Steel,<br>32nd Foot .        | Sept. 11.<br>April 30. | 23               | 5 9 $\frac{1}{2}$<br>5 9 $\frac{1}{2}$   | 11 3<br>11 12             | 11<br>11 $\frac{1}{2}$               | 12<br>13                             | 36 $\frac{1}{2}$<br>38 $\frac{1}{2}$ | $\frac{1}{2}$<br>$\frac{1}{2}$ | 9<br>9                             | $\frac{1}{2}$<br>$\frac{1}{2}$     | 1<br>1                             | 2<br>2                             |
| 7             | " Bartlett,<br>R. A. .         | Sept. 11.<br>April 30. | 23               | 5 9<br>5 9 $\frac{1}{2}$                 | 10 6<br>10 11             | 10 $\frac{1}{2}$<br>11               | 12<br>13                             | 36<br>38 $\frac{1}{2}$               | $\frac{1}{2}$<br>$\frac{1}{2}$ | 5<br>5                             | $\frac{1}{2}$<br>$\frac{1}{2}$     | 1<br>1                             | 2 $\frac{1}{2}$<br>2 $\frac{1}{2}$ |
| 8             | " Kearney,<br>10th Foot .      | Sept. 11.<br>April 30. | 24               | 5 8 $\frac{1}{2}$<br>5 9 $\frac{1}{2}$   | 10 8<br>11 6              | 10 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 12 $\frac{1}{2}$<br>14               | 35<br>40                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 12<br>12                           | 1<br>1                             | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 5<br>5                             |
| 9             | Corporal Sheppard,<br>R. E. .  | Sept. 11.<br>April 30. | 26               | 5 6 $\frac{1}{2}$<br>5 6 $\frac{1}{2}$   | 9 5<br>9 11 $\frac{1}{2}$ | 10<br>10 $\frac{1}{2}$               | 11 $\frac{1}{2}$<br>12 $\frac{1}{2}$ | 33<br>36                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 6 $\frac{1}{2}$<br>6 $\frac{1}{2}$ | $\frac{1}{2}$<br>$\frac{1}{2}$     | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 3<br>3                             |
| 10            | Sergeant Beer,<br>R. A. .      | Sept. 11.<br>April 30. | 26 $\frac{3}{4}$ | 5 11 $\frac{1}{2}$<br>5 11 $\frac{1}{2}$ | 12 6<br>13 1              | 11 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 13<br>14                             | 41<br>42                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 9<br>9                             | —<br>—                             | 1<br>1                             | 1<br>1                             |
| 11            | " Cox,<br>16th Lancers         | Sept. 11.<br>April 30. | 28               | 5 7 $\frac{1}{2}$<br>5 8 $\frac{1}{2}$   | 10 10<br>11 9             | 10 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 12 $\frac{1}{2}$<br>13 $\frac{1}{2}$ | 37<br>40                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 13<br>13                           | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 3<br>3                             |
| 12            | " Rafferty,<br>45th Foot .     | Sept. 11.<br>April 30. | 28               | 5 10 $\frac{1}{2}$<br>5 11               | 10 9<br>11 11             | 10 $\frac{1}{2}$<br>11 $\frac{1}{2}$ | 13<br>14                             | 37<br>40                             | $\frac{1}{2}$<br>$\frac{1}{2}$ | 16<br>16                           | 1 $\frac{1}{2}$<br>1 $\frac{1}{2}$ | 1<br>1                             | 3<br>3                             |

ARCHIBALD MACLAREN,  
The Gymnasium, Oxford.

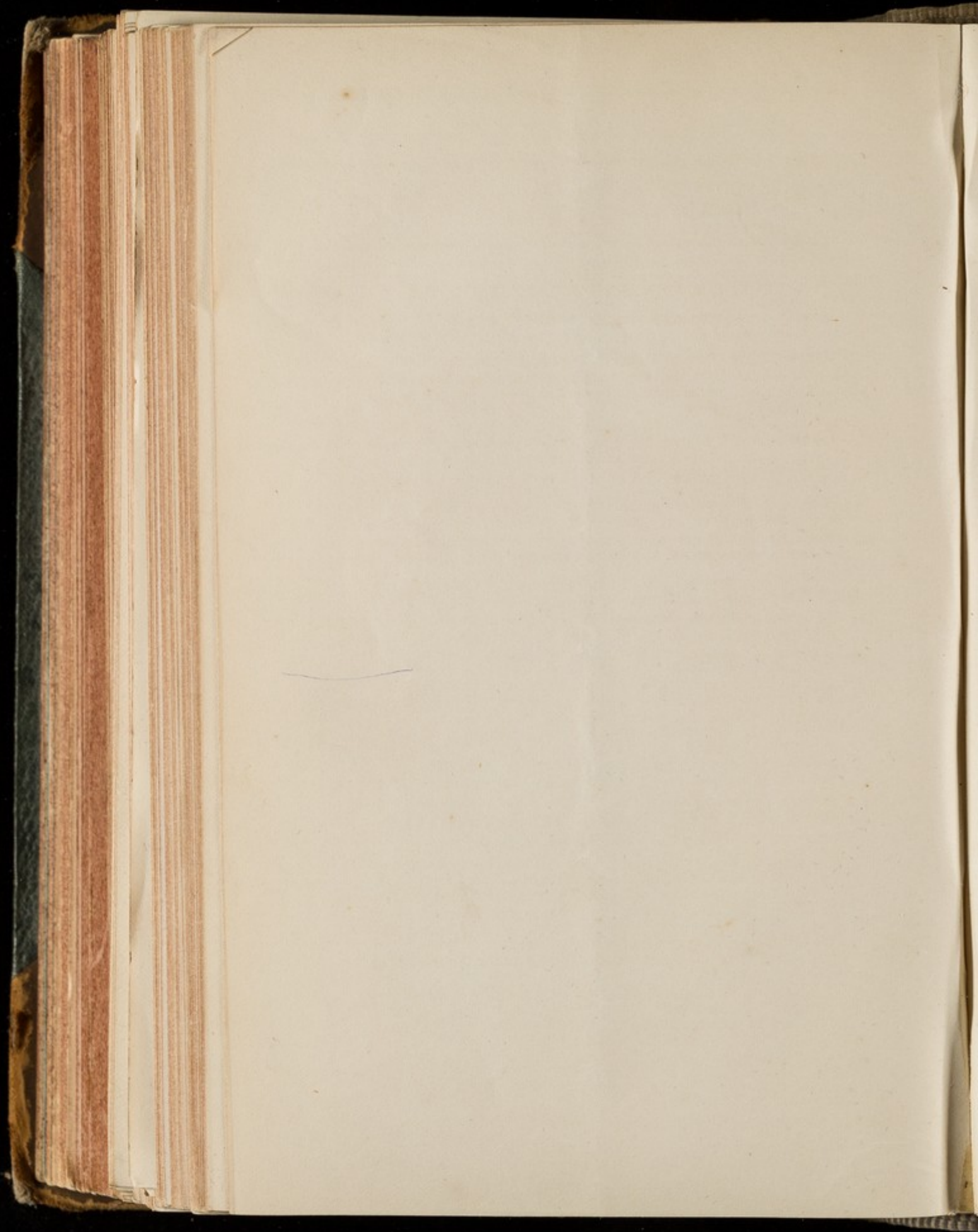














[From the BRITISH MEDICAL JOURNAL.]

SURGEON-GENERAL G. S. BEATSON, C.B.,  
HONORARY PHYSICIAN TO THE QUEEN.

THE death of Surgeon-General Beatson appears to demand some further mention than the brief obituary notices which have as yet been published, both on account of the very important position he held in the medical department of the army, the services which he had rendered, and the serious loss which both his own department and the army generally sustain by his unexpected and comparatively early death. Having graduated at Glasgow and Edinburgh, George Stewart Beatson joined the medical department of the army at Fort Pitt in 1838, and, on July 13th of that year, received his first commission. He was appointed to an assistant-surgeoncy in the 71st Highlanders, but never joined that corps, and, in 1839, embarked on the staff for Ceylon; thus commencing a long term of Eastern service, which, interrupted by intervals of duty in other parts of the world, comprised the greater part of his career.

After a tour of twelve years in Ceylon, where he married, and where, in 1846, he was promoted, Dr. Beatson returned to England in 1851, and almost immediately re-embarked for Madras as surgeon of the 51st Light Infantry, and with that corps took a part in all the important operations of the Burmese War of 1852-53. Accompanying his regiment to England, Dr. Beatson arrived at home in August 1854; was advanced to the rank of staff-surgeon of the 1st Class in October of the same year, and immediately proceeded to Turkey. It was not his good fortune to witness the active operations of the Crimean War, but he was busily and usefully employed in the hospitals of Koolalee, Scutari, and Smyrna, ultimately embarking in October 1855 for Balaklava, and serving there as principal medical officer till June 30th, 1856. After a short period of service on half-pay, Dr. Beatson was one of several first-class staff-surgeons who, after being in the position of administrative officers, were placed in executive charges, and as such he was appointed to the newly raised 2nd Battalion of the 22nd Foot, with which he did duty until promoted by Mr. Alexander, then director-general, to be deputy inspector-general of hospitals on December 31st, 1858, in the same gazette with the present director-general, Sir William Muir, with Surgeons-General Frazer, Longmore, and ~~James~~ *James*. Dr. Beatson had entered the army without any special interest or assured prospects of promotion; and, although senior by several years to some of his contemporary deputies, his advancement, after only twenty years' service, was rapid, and was due entirely to the abilities which he manifested for the duty of the higher ranks.

Although he was personally unknown, or scarcely known, to the Director-general, Mr. Alexander, that authority, ever ready to recognise ability, and to advance deserving officers, whether among friends or others, saw in Dr. Beatson the qualities which fit a man for administrative work, and, by his promotion, turned them to account for the good of the department. After serving for a time as Deputy Inspector-General of Hospitals in the Ionian Islands, Dr. Beatson was sent to



Madras, to assume superintendence of the medical department of Her Majesty's British Forces in that Presidency—a charge for which he was especially fitted from his previous service and experience. In May 1863, on the retirement of Inspector-General (now Sir William) Linton, he succeeded to the charge of the entire department in India, and joined the head-quarters of Lord Strathnairn as Principal Medical Officer of Her Majesty's British Forces, the most lucrative, as well as the most important, appointment which can be held by any officer junior to the Director-General.

Dr. Beatson assumed his new charge at a critical and most important time. Up to the year of the Mutiny, the position held by the British Medical Department in India was far from satisfactory. There was but one Deputy Inspector-General of Hospitals in each of the minor Presidencies, and one Inspector-General in Bengal. Their duties were almost nominal, and consisted chiefly in the compilation of statistical returns, the professional and financial supervision being virtually in the hands of the superintending surgeons of the Honourable East India Company.

Some advance had, however, been made up to 1863. There had been an increase to the administrative ranks, and the Inspector-General of Hospitals was recognised as a member of the Army Head-Quarters Staff, the professional and sanitary adviser of the Commander-in-chief on all questions connected with the British Forces. Still much remained to be done: the *status ante bellum* was in many respects maintained; the financial direction of British hospitals was not in the hands of medical officers of the British Service; the newly acquired artillery, cavalry, and infantry, transferred from the East India Company's Forces, were still in charge of medical officers of the Indian Army, whose allegiance was divided; there was an obsolete code of rules, a defective subordinate establishment, a faulty system of equipment, each needing alteration; and there was, besides, a sanitary commission, then a sanitary commissioner, first a civilian, afterwards a major in the army, holding direct communication with Government, exercising great power, and trenching in many ways on the legitimate functions of the Principal Medical Officer.

In his relations with this anomalous institution, Dr. Beatson could only accept what the Supreme Government had decided upon, and, in the treatment of questions, could but concur when the action was right, and record his dissent when views were advanced which he knew to be injudicious. To the important questions which came before him—the proposed amalgamation of the British and Indian Medical Services, the rectification of the position of his own department—as well as to those questions having more direct bearing on the welfare of the British soldier, Dr. Beatson brought long experience, clearly formed views, and sound judgment, as well as capabilities for work to which few, if any, of his predecessors could lay claim.

The history of Dr. Beatson's first tenure of office as head of the medical department is virtually the history of that department from the transition state of 1857 to that which it now occupies. By firmness, tact, and the weight of his local knowledge and experience, Dr. Beatson effected many improvements; and, during the five years, from 1863 to 1868, many important reforms were carried out. A large increase to both administrative and executive ranks of the department was established; the anomaly was abolished by which professional and financial details were vested in separate authorities of distinct services; a more complete subordinate establishment was allowed; a new system



of purveying ; a revised scale of dietary ; and improved plan of hospital equipment, were all introduced, while many obsolete rules were abrogated and new ones were substituted. All British troops were in medical charge of officers of the British Medical Service, subordinate to the Inspector-General, while he was himself recognised as in a position of direct adviser to the Supreme Government on questions of interest to the British Forces.

In the vitally important question, too, of improved barrack-accommodation, and the large increase to the hill-stations for the European Forces, Dr. Beatson's views were accepted by the Government of India, and, in a great measure, carried out. Thus, when Dr. Beatson embarked for England in 1868, he left the department to his successor Dr. Muir in a state vastly changed and improved, and it required but the judicious selection of subordinate administrative officers to make permanent the position it should hold, and to secure for the advice which its members might be called upon to give that weight and consideration which ability and experience, when united, cannot fail to command.

Dr. Beatson, having been relieved in India by the present Director-General, returned to England, and assumed medical charge of the Royal Victoria Hospital at Netley. Here the inconsistency of the system of military hospital administration became strikingly apparent. An officer second only to the Director-General in England, holding the rank of major-general, and who, for five years, had not only superintended the hospital administration of the whole of India, but had been in direct communication with the Supreme Government and military authorities of that country, found himself subordinated first to a major-general, as governor of the hospital, and subsequently to a lieutenant-colonel, to whom, or to any junior military officer acting for him, he was obliged to refer matters of even trivial importance, and whose orders on various subjects he was expected to carry out.

It could not be wondered at that, on the transfer of Dr. Muir from India to Whitehall in 1872, Dr. Beatson welcomed the order which relieved him from such a position, though the order necessitated a return to India, and separation from many members of his family.

The appointment of Dr. Beatson a second time to the charge of the department in India called forth at the time numerous comments, and those who were uninformed of the real state of the case imagined that, in his holding again the great prize of the service, an injustice was done to others : yet it was in the ordinary routine of the service, unaltered by favour or affection, that Dr. Beatson was again sent to Bengal. He was at the time first on the list of Inspectors-General for foreign service, and would have been equally obliged to go abroad wherever the vacancy had occurred. As it happened, the vacant post was the same which he had before held, and it would have been unjust to him to deviate from the ordinary course of relief to give advantage to another officer. During the four years of his absence from India, while Dr. Muir held charge, the interests of the department had been well maintained, and in some respects improved ; so that Dr. Beatson might well hope, as he did, to be able to conduct the affairs of his office without the anxieties of changes and the necessity for new reforms.

But the movements of the Government and the army head quarters, together with the special superintending duties of his post, compelled him to travel long distances, to undergo considerable fatigue, and to spend part of two hot seasons in Calcutta. He had suffered from attacks of fever from time to time, and, when in Calcutta during April



last, was sorely tried by the climate. As he expressed it, he felt "he had enough of India"; and, considering how many years of his service he had spent there and in Ceylon, he might well say so. Ordered to join his office at Simla, he left Calcutta on April 22nd; but, his constitution having been gradually, though surely, undermined, he suffered greatly on the journey, arriving at Simla on May 4th in a state of prostration, from which he never completely rallied. Particulars of his illness and death have not yet, of course, been received; but it is known that he had repeated febrile attacks, with hepatic pain; and, at the date of the last letters received, May 21st, he was much worse: temporary improvement had passed away, and he had lost all the little ground he had gained.

Nothing further is known beyond the brief telegram received on June 8th, stating that he had died on the previous day. In all probability, liver-abscess was the cause of death.

In Dr. Beatson, the Army Medical Department has lost one of its most able members, and one marked by the opinion of his brother officers as fit to succeed to the highest departmental position. He possessed a singularly accurate and retentive memory, which, in a position such as his, where so much depends upon precedent and regularity, was especially valuable. He was seldom wrong in the facts upon which he formed his opinions, and his deductions were clear and logical. His remarkable clearness and accuracy were very prominent on the occasion of his examination before Mr. Sidney Herbert's Committee in July 1857; and it was the impression which his evidence made upon Mr. Alexander, as well as on the several members of that committee, which, perhaps, more than anything else marked him as fitted for advancement. In his career in India, where more than elsewhere he was prominently before the eyes of the department, he showed great zeal and energy in the cause of the British soldier.

Second only to the interests of the army and the public, he held the interests of the medical department in the highest consideration; and only those who were in official intercourse with him know how much his brother officers owe to his exertions. Few were so well acquainted with all matters connected with the service, and none could be more jealous of its welfare. In his administration, he was invariably just; and, while liberal and indulgent to those who showed that their duty was their first consideration, he was strict in his efforts to repress anything detrimental to the professional or social character of the department over which he presided. He never carried official differences into private life, and was on terms of the happiest social intercourse with those whom he could not but oppose in their public capacity. He was a strong supporter of the new departmental system, and an advocate also of amalgamation with the Indian Medical Services, on the basis of separation of the civil from the military elements. In every relation of life he was genial, kind, and considerate; and his death will long be felt, not only by his widow and immediate family, but by very many others who were much attached to him, and who have to regret a friend not soon forgotten and not easily replaced.



# NOTICE

SUR

## L'HYGIÈNE DES HOPITAUX MILITAIRES

LUE A L'ACADÉMIE IMPÉRIALE DE MÉDECINE, DANS LES SÉANCES DU 41

ET DU 18 FÉVRIER 1862,

PAR M. LE BARON H. LARREY,

Médecin inspecteur, Membre du Conseil de santé des armées, etc. ;

ANALYSE PAR LE D<sup>r</sup> ANTONIN MARTIN,

Médecin aide-major de première classe.

En agitant dans son sein la question si importante de l'hygiène des hôpitaux, l'Académie de médecine a fait appel aux lumières et au concours de chacun. Trois médecins militaires des plus autorisés, MM. Bonnafont, médecin principal de première classe, le baron Larrey et Michel Lévy, médecins inspecteurs, membres du Conseil de santé, ont successivement apporté à la tribune le tribut de leur savoir et de leur longue expérience.

Dans un exposé très-intéressant, M. Bonnafont a fait connaître l'organisation de plusieurs hôpitaux étrangers qu'il lui a été donné d'observer.

M. le baron Larrey a tracé, avec autant de conscience que d'exactitude, le tableau fidèle de l'état actuel de nos hôpitaux militaires ; aucun des préceptes de l'hygiène n'a été oublié ; mais celui qui domine tous les autres, c'est la nécessité d'éviter à tout prix l'encombrement dans les



tation meilleure, plus choisie, plus variée, grâce à une latitude plus grande laissée aux prescriptions des médecins.....

Cette question des hôpitaux civils incidemment vidée, M. Larrey reprend, pour ne plus la quitter, celle de l'hygiène des hôpitaux militaires.

« Les établissements hospitaliers d'une armée..... sont, « pour ainsi dire, des redevances de l'État envers ses défenseurs. »

Ce principe qui domine toute la question des hôpitaux militaires a été compris à l'étranger comme en France ; l'intéressante relation de M. Bonnafont en fait foi, et les splendides hôpitaux militaires de Vienne, de Berlin, de Saint-Petersbourg, de Londres, en sont un éclatant témoignage.

Tous les médecins militaires savent que nos hôpitaux réorganisés par la Convention nationale, régularisés sous le Consulat et le premier Empire, sont actuellement au nombre de cent répartis en France et en Algérie ; les uns dits hôpitaux *permanents*, pour le temps de paix ; les autres *temporaires*, subdivisés en hôpitaux de première, deuxième et troisième ligne, permettant en temps de guerre d'assurer les évacuations et d'éviter l'encombrement.

*L'armée n'a pas d'hôpital pour les aliénés.* En exprimant le vœu que cette lacune soit remplie, M. Larrey appelle l'attention sur Bicêtre et la Salpêtrière, où les incurables sont encore avec les aliénés.

A propos des hôpitaux de l'Algérie, qui reçoivent, outre les militaires, des femmes et des enfants, l'orateur se range à l'avis de M. Davenne quant au principe de la séparation des enfants dans des hôpitaux spéciaux, ou pour le moins



dans une salle réservée spécialement pour eux dans chaque hôpital; la morale y gagnerait.

L'orateur passe successivement en revue les hôpitaux militaires de Paris.

Le Val-de-Grâce, que les rapports de Tenon, Leroy et Sabatier signalent comme plus salubre que l'Hôtel-Dieu; son agrandissement ultérieur l'a rendu plus salubre encore.

Le Gros-Caillou, ancien hôpital de la garde, est salubre, à la condition d'en éviter l'encombrement (1).

L'hôpital de Vincennes, nouvellement bâti, confié à la surveillance éclairée d'un savant hygiéniste, M. Boudin, son médecin en chef, peut être regardé comme un hôpital modèle.

Celui de Saint-Martin, destiné à recevoir prochainement les malades de la rive droite de la Seine.

L'hôpital de Versailles, grandement établi, peut servir d'utile déversoir pour le trop-plein de ceux de Paris, dans des circonstances données.

L'infirmerie des Invalides, dont l'état sanitaire est généralement bon.

Quant aux salles militaires des hôpitaux civils, leurs conditions de salubrité varient selon les localités.

Les infirmeries régimentaires auxquelles M. Larrey trouve une heureuse analogie avec l'institution des secours

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(1) Il est regrettable cependant que cet hôpital se trouve de plus en plus entouré de constructions élevées. En face de lui, sous le nom impropre de *passage*, vient de se bâtir une rue étroite, à maisons très-élevées, rare infraction aux lois qui président aux constructions actuelles. (A. M.)



à domicile, ont le double avantage de diminuer l'affluence des malades dans les hôpitaux militaires, et aussi de soustraire les soldats légèrement atteints aux influences de l'atmosphère nosocomiale.

A propos des hôpitaux de la marine, M. Larrey invoque l'expérience de M. Reynaud, inspecteur général du service de santé de la marine, qui a pu produire, augmenter, diminuer ou supprimer les effets de l'encombrement dans une même salle, en abaissant ou en élevant le nombre des malades.

Les principales règles hygiéniques relatives à la salubrité des hôpitaux sont exposées avec détail par M. Larrey. Quant aux hôpitaux en général, il faut : 1° éloigner les hôpitaux des centres de population, sauf à pourvoir au transport des malades du mieux qu'il sera possible ;

2° En choisir l'emplacement loin des lieux insalubres, sur un terrain un peu élevé, à proximité de cours d'eau, les orienter convenablement, les entourer de plantations ;

3° Quant à la construction, si la forme carrée des hôpitaux construits par Vauban a quelques avantages pour l'exécution et la surveillance du service, elle est inférieure, sous le rapport de l'aération et de la salubrité, au système des pavillons isolés, d'après le principe de Tenon ;

4° Moins un hôpital aura d'étages, plus il sera salubre ; choisir de préférence les rez-de-chaussée pour salles de chirurgie ;

5° Eloignement et séparation de l'hôpital de ses dépendances, pharmacie, cuisines, boucheries, amphithéâtre, etc. ;

6° Les latrines dites à la turque sont insuffisantes et in-



commodes pour les hôpitaux, où l'on devrait préférer des sièges à support assez étroits sur leurs bords, pour que les malades ne puissent monter dessus.— Placer et désinfecter à part les urinoirs et y établir un filet d'eau courante ;

7° Etablir des promenoirs plantés d'arbres, et, pour la mauvaise saison, des galeries couvertes ;

8° « Les escaliers seront larges, spacieux, bien éclairés,  
« pour faciliter à toute heure l'accès des salles et permettre  
« en tous sens la manœuvre des brancards. Clos à leur ou-  
« verture par des portes vitrées, ils ne communiqueront  
« point directement avec les salles, de façon à éviter l'action  
« pernicieuse des courants d'air. »

« L'installation des salles est le point essentiel de la  
« question d'hygiène hospitalière. » On devra se régler sur  
les préceptes suivants :

1° Approprier chaque bâtiment à un nombre limité de salles, et surtout chaque salle à un nombre restreint de lits. La contenance des salles, suivant leur capacité relative, peut être bornée à 10, 15 ou 20 lits, s'étendre souvent à 30 ou 40, mais ne devrait point dépasser 50 places ;

2° Séparer les salles les unes des autres par des paliers, des vestibules, des officines ou des chambres réservées aux grands malades ;

3° Séparer les trois grandes catégories de malades, fiévreux, blessés, vénériens, en salles distinctes ; isoler les maladies éruptives et contagieuses ;

4° La capacité cubique doit être de 30 mètres, *au moins*, pour chaque lit, et davantage toutes fois qu'on peut l'obtenir ;



5° Les lits seront espacés entre eux d'un mètre à peu près; l'intervalle de 65 centimètres ne suffit pas. — 2 ou 3 mètres, au moins, sont nécessaires entre chaque rangée de lits. Pour le placement, on devra, autant que possible, faire alterner les hommes atteints d'affections légères ou de plaies non suppurantes avec ceux qui sont atteints d'affections graves, comme le faisait M. Larrey au Val-de-Grâce;

6° L'évacuation successive des salles sur des salles de rechange, et leur blanchiment à la chaux ou au chlorure de chaux, sont d'excellentes mesures mises en usage tous les six mois dans les hôpitaux militaires;

7° Enfin, d'autres précautions relatives au balayage, au lavage, etc., des salles sont dans les hôpitaux l'objet de prescriptions réglementaires bien entendues;

8° Quant à la literie, M. Larrey a l'espoir de voir un jour la paille remplacée avantageusement par le sommier élastique;

9° Les lits ne seront pas adossés immédiatement aux murs de la salle, afin d'éviter l'humidité et de permettre la circulation de l'air;

10° Ils seront plutôt élevés que trop bas, par raison d'hygiène pour le malade et de commodité pour le médecin;

11° Les rideaux entravent la circulation de l'air, retiennent les miasmes, les insectes; on ne devrait les conserver que pour les salles des femmes et des ophthalmiques. D. Larrey a observé aux Invalides qu'ils favorisaient les suicides par strangulation, et les y a fait supprimer.

12° Relativement au chauffage et à la ventilation, les systèmes si ingénieux de MM. Léon Duvoir et Leblanc, Tho-



mas et Laurens, Grouvelle et Chevalier ne semblent pas avoir eu jusqu'à présent une influence sensible sur la mortalité.

MM. les inspecteurs Maillot et Poggiale, après les avoir étudiés comparativement, préfèrent celui de Van Hecke ; M. Boudin obtient de bons résultats de celui de M. Léon Duvoir. M. Larrey incline vers les cheminées d'appel, inventées par Percy, perfectionnées par Darcet, étudiées et perfectionnées encore par le savant général Morin.

Malgré ses nombreux inconvénients, l'aération naturelle par les fenêtres opposées et les vasistas reste le moyen le plus simple et le plus facile à employer ; on le compléterait par de larges cheminées dont le feu réjouirait et distrairait mieux les malades que les calorifères actuels ;

13° Après la ventilation et comme son complément souvent indispensable, viennent les désinfectants ; fumigations de chlore, de chlorure de chaux, etc.

Ce sont les miasmes et l'infection, résultats de l'encombrement qui, joints aux fatigues et aux privations de la guerre, donnent naissance à ces terribles épidémies des armées, peste, fièvre jaune, choléra, dyssenterie, typhus, pourriture d'hôpital (ce typhus des plaies), et enfin l'infection purulente.

Les congélations sont aussi une cause puissante d'infection, de même qu'une foule d'autres maladies dites infectieuses, qui nécessitent l'isolement des malades et des précautions hygiéniques particulières.

Des causes puissamment débilitantes, spéciales à la vie militaire, viennent malheureusement contre-balancer les



résultats avantageux que l'on serait en droit d'espérer de l'exécution de ces mesures d'hygiène dans nos hôpitaux.

A toutes ces conditions de salubrité, M. Larrey rattache, comme en étant le complément, les soins bien entendus et toujours donnés à temps, soit à l'infirmerie, soit à l'hôpital ; l'alimentation toujours surveillée sous le rapport de sa qualité et de sa quantité par les médecins en chef ; l'exercice de la promenade ; des influences morales particulières, telles que l'espoir d'un congé de convalescence, etc. ; et en dernière analyse, la triple surveillance médicale, administrative et militaire, sûre garantie de la bonne exécution du service.

M. Larrey voudrait voir la *gymnastique* « appropriée aux « indications de la maladie ou de la convalescence » s'introduire dans nos hôpitaux militaires.

Mais une institution plus importante encore manque à notre armée, et à son sujet M. Larrey exprime un vœu auquel, nous n'en doutons pas, s'associeront tous les médecins militaires : « La création des *asiles de convalescence* « pour les hôpitaux civils, à Vincennes et au Vésinet, doit « prospérer comme un des bienfaits publics de notre époque. « C'est là une œuvre grandement charitable, dont l'application à l'armée serait digne de la haute sollicitude du « Gouvernement. »

La mortalité dans nos hôpitaux reconnaît encore d'autres causes telles que le genre de vie propre au soldat, diverses aptitudes physiques et morales spéciales à chaque individu, des conditions inhérentes aux hôpitaux eux-mêmes, mais dominées toutes par l'encombrement ; l'insuffisance des me-



sures d'hygiène ; l'effet direct de la réunion d'un grand nombre d'opérés dans le même hôpital : aussi l'isolement, l'air pur de la campagne sont-ils éminemment favorables à ces derniers ; c'est ce qui a déterminé l'administration de l'assistance publique à installer hors de Paris un petit hôpital exclusivement destiné aux graves opérations de la chirurgie ; c'est ainsi que s'expliquent encore les heureux résultats obtenus si souvent par les médecins militaires en campagne, opérant en plein air, sous la tente, dans des ambulances découvertes, etc.

L'orateur termine cette première partie de son discours en indiquant la manière dont est instituée la statistique des hôpitaux militaires et les heureux résultats qu'on est en droit d'en espérer.

Joindre l'exemple au précepte, tel est l'objet de la seconde partie du discours de M. Larrey. Il fait passer successivement sous les yeux de l'Académie le sombre tableau de la campagne de Crimée et celui beaucoup moins affligeant de la guerre d'Italie. L'un et l'autre, par des voies opposées, fournissent la preuve désormais incontestable de la pernicieuse influence de l'encombrement et l'indication essentielle de la dissémination des malades et des blessés.

M. Larrey indique sommairement tous les documents officiels, non officiels ou inédits se rattachant à la guerre de Crimée, en invoquant l'autorité plus compétente de M. Michel Lévy, qui a tant vu et tant fait pendant la première période de cette campagne.



Dans les rapports de M. Lévy se rencontrent à chaque page des exemples des funestes effets de l'encombrement, à Péra, à Varna, en Crimée, à bord des navires ; il démontre, d'après l'expérience acquise, qu'au-dessus de 800 lits les hôpitaux s'infectent ; il établit par une déclaration formelle l'imminence du typhus et la nécessité de multiplier l'installation des hôpitaux, des baraques et des tentes, et recommande instamment toutes les mesures d'hygiène dont mieux que personne il pouvait apprécier l'importance.

MM. Baudens et Scrive viennent après lui ; leur but est toujours le même ; les mesures qu'ils prescrivent ont toujours un résultat identique, dissémination des hommes valides dans les camps, des malades dans les ambulances ; mais « les causes et la propagation des épidémies semblaient au-  
« dessus des ressources dont pouvaient disposer le comman-  
« dement et l'administration. »

Enfin, les documents fournis par MM. Félix Jacquot, Garreau, et plus particulièrement par M. Cazalas, établissent que l'encombrement dans les camps et dans les hôpitaux a été la cause immédiate du typhus. Les faits qu'ils citent ne le démontrent que trop ; ainsi, le typhus décimait cruellement les hôpitaux militaires de Péra et de Rami-Tschifflick encombrés de malades, alors qu'il se montrait à peine à l'hôpital de l'École militaire, à l'hospice civil de Péra et qu'il respectait le personnel de l'infirmierie Saint-Benoît où furent traitées 54 sœurs de charité atteintes de typhus ; aucune de ce nombre n'y succomba.

Dans les ambulances comme sur les navires, la même cause, l'encombrement, a développé les mêmes effets, la pro-



pagation de la maladie aux malades non typhiques et au personnel médical et administratif. Sur 160 sœurs, 41 sont mortes ; l'effectif moyen de 345 officiers de santé a donné 83 décès dont la majeure partie est due au typhus (1).

La campagne d'Italie fut entreprise dans des conditions plus favorables sous tous les rapports, sauf les inconvénients résultant des grandes agglomérations d'hommes, des marches rapides, des privations passagères, des conditions atmosphériques et climatiques.

L'encombrement et ses dangers étaient seuls à craindre. C'est à les prévenir que M. le baron Larrey employa tous ses soins et toute sa haute autorité comme médecin en chef de l'armée et comme chirurgien de l'Empereur : aussi le but qu'il poursuivit partout et toujours fut la dissémination des malades et des blessés.

Les hôpitaux militaires ou civils existant en Italie, la plupart parfaitement organisés et administrés, étaient loin de suffire à tous les besoins. Casernes, collèges, palais, couvents, écoles, séminaires, voire même les églises, furent transformés en asiles pour nos blessés et nos malades. Grand nombre d'entre eux furent recueillis dans des maisons particulières et y trouvèrent, comme dans les hôpitaux, des soins affectueux. Les hôpitaux devenaient plus nom-

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(1) Le personnel administratif, mais surtout les infirmiers, ont eu leur part du sacrifice comme ils ont eu celle du dévouement ; la mort a largement moissonné dans les rangs de nos braves et modestes auxiliaires.



breux à mesure que l'on approchait du théâtre de la guerre ; ainsi, alors que Gênes en possédait 8, Alexandrie 9, on en comptait 23 à Milan et jusqu'à 38 à Brescia.

A ce chiffre déjà considérable, il faut ajouter celui de tous les hôpitaux secondaires des villes moins importantes traversées par notre armée victorieuse, les ambulances établies près des champs de bataille ; et l'on verra comment, grâce aux sages mesures concertées entre le commandement, l'autorité administrative et le service de santé, la dissémination des malades fut poussée aux limites du possible, et comment l'armée fut ainsi sauvegardée des épidémies, compagnes inséparables de l'encombrement, et d'autres accidents déplorables qu'on ne peut attribuer qu'à lui.

Presque partout les médecins français furent secondés par les médecins italiens. MM. Boudin, Cazalas, Champouillon, Salleron, Bertherand, Brun, Isnard, etc., eurent la haute direction du service des ambulances et des hôpitaux ; leur expérience et leur savoir pouvaient seuls égaler la grave responsabilité qu'ils partagèrent pendant et après la campagne.

Pour donner une idée de la tâche pénible qui leur incombait et aussi de la nécessité de l'établissement d'un nombre aussi considérable d'hôpitaux, M. Larrey rappelle que, dans cette courte campagne, le chiffre approximatif des blessés s'est élevé à 42,000 ou 44,000, dont 13,474 Français, 5 à 6,000 Piémontais, 24 à 25,000 Autrichiens. Eh bien ! sur un nombre aussi considérable de blessés, on n'eut à déplorer qu'un chiffre proportionnellement très-restreint de gangrène traumatique et de pourriture



d'hôpital ; ces accidents fâcheux, toujours sporadiques, se manifestèrent plus particulièrement dans l'hôpital San-Francesco, immense caserne, un moment encombrée de blessés autrichiens.

Les hémorrhagies primitives et consécutives, mais surtout le tétanos, ont été les complications les plus redoutables des blessures. Celui-ci s'est principalement manifesté chez les amputés, surtout à Brescia, dans les froides églises servant d'hôpitaux. M. Larrey en cite 107 cas observés dans divers hôpitaux ; 61, presque tous funestes, ont été observés à Brescia.

L'infection purulente a été rare.

On se tromperait si l'on n'attribuait qu'aux mesures hygiéniques tout le bénéfice de ces heureux résultats. La sage pratique des chirurgiens, leur habileté à saisir l'opportunité des opérations immédiates, à les exécuter et à en assurer le résultat par une thérapeutique bien entendue, tout en faisant une part de plus en plus large à la chirurgie conservatrice ; une pratique médicale aussi prudente qu'éclairée ; le zèle, le dévouement de tous convergèrent vers le même but, la guérison des malades.

La mortalité générale par suite de blessures a été beaucoup plus considérable parmi les Autrichiens que parmi les Français et les Italiens réunis ; diverses causes morales et des circonstances particulières trop longues à énumérer en donnent suffisamment la raison.

« Les maladies de la campagne d'Italie ont été à peu près nulles pendant la durée de l'expédition ; » la proportion des maladies a augmenté au retour de l'armée et



durant l'occupation ; mais jamais elles n'ont présenté de gravité et encore moins de caractère épidémique. Les diarrhées, les dyssenteries et les maladies vénériennes ont surtout prédominé. La statistique des décès par maladie, difficile à établir, a été en moyenne encore bien au-dessous des probabilités, grâce à l'absence de toute épidémie ; nouvelle preuve de l'utilité de la dissémination des malades.

« Le même système de dissémination et d'aération a été appliqué avec les plus brillants résultats aux 10,000 chevaux de l'armée par M. Moulin, vétérinaire en chef. Sur ces 10,000 chevaux, un seul a été atteint de la morve et en est mort.

De tout ce qui précède, M. le baron Larrey conclut « *que la prophylaxie de l'encombrement domine toute la question soumise au jugement de l'Académie* ; toutes les autres questions sont secondaires à celle-là. »

Il exprime le vœu que, pour les hôpitaux civils, des mesures tendant à en diminuer l'encombrement, sans négliger les autres prescriptions de l'hygiène, soient proposées et discutées par des commissions nommées par l'autorité, et il termine « en appelant sur une question de « cette importance la sollicitude, l'intervention et l'appui « du Gouvernement. » A. M.

FIN.



# HOSPITAL SERVICE

OF THE

## FRENCH ARMY IN THE EAST.

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(Translated from the *MONITEUR DE L'ARMÉE* of the  
20th of October.)

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THE *Journal des Debats*, quoting the correspondents of English newspapers, gave us two days back a painfully interesting narrative of the sufferings to which the wounded in Lord Raglan's army had been subjected, as well as the wounded Russians entrusted to the care of that army. When we recollect the attention that is bestowed by our neighbours on the other side of the channel, upon every necessity of the soldier, and even on superfluities for his comfort (*confort*), it is impossible to deny that the serious inconveniences pointed out in the accounts that have just been made public, are the results of an improperly adjusted financial arrangement, or of a negligence that painfully contrasts with that liberality which is the characteristic of the English administration of the affairs of the army and navy.

On the other hand, but a few months since, the organiza-



tion of the English medical and hospital service, was cited as a model for our imitation: our attention was especially directed to the fact that the English military surgeons had complete control over everything that related to the supplies and to the administration of their hospitals, and that as a consequence all would go on admirably well; and persons were not wanting who wished, when the question of reorganizing our medical staff was raised, that we should adopt this plan, so perfect, and so precise in its workings.

If affairs are really so well ordered in England, and if the reports that have arrived from the East are correct, we are forced to come to the conclusion that the English medical pre-arrangements were insufficient, not only in respect to the staff attached to the army, but also in regard to dressings, and to the material, and means of transport. In short, what would have been the result if a sudden hurricane had arisen, and separated the English even for a short time from their ships; if, in the absence of litters, the brave sailors had not been present to offer their oars; and if, moreover, their wounded countrymen had not found on the decks of these vessels an asylum, and some attention, though, as we see in the accounts of the overcrowding of the wounded, very incomplete!

It is consoling to the relatives of the brave soldiers of France, to find by the side of this recital of the sufferings which have weighed so cruelly upon the English army, evidence of the active and intelligent care which has preserved our own wounded. Thanks to the admirable organization of ambulances and hospitals in the medical service



amongst our troops, no sooner does a man struck in the ranks fall, than he is carried to the rear, where the regimental medical officer (*officier de santé regimentale*) pays the first attention to his wounds by the aid of the dressings which are at hand in charge of a soldier. If it is a severe wound, the sufferer is led or carried to the provisional post, where the chests of the regimental ambulance are established, and, if necessary, to the ambulance of the division. A sufficient number of attendant soldiers (*soldats infirmiers*), of seats (*cacolets*) fixed on pack-saddles borne by mules, are always in readiness to carry the wounded from the field of battle, and convey them to this ambulance, under the immediate direction of the officers of administration entrusted with that duty, and under the active *surveillance* of the deputy military intendant, in whose hands this important part of the duties of the administrative service is placed.

The English surgeons, it would appear, do not sufficiently appreciate the advantages presented by this plan of removing and transporting the wounded. They prefer to *cacolets*, which have answered so admirably in Africa, and which are at this moment doing such good service in the East, a species of ambulance waggon, upon which the London press, some few months since, delivered a pompous eulogy. We have seen a coloured plan of this carriage, and we are far from allowing it the merit which has generally been attributed to it.

The front part, divided from the rest like the *coupé* of our public conveyances, holds three sick men \* who are capable of

\* This is a mistake; the front part holds six, instead of three men.



sitting upright, but the seats are placed sideways, as in omnibuses. The back part of the waggon is arranged for the reception of four sick or wounded men, who are laid horizontally on frames made to slide in like drawers: two being placed at the bottom of the carriage, and the two others above, an arrangement similar to the berths in steam-boats.

This painful method \* of transporting the sick soldier presents a number of inconveniences, especially for those placed in the lower frames. Moreover, the waggon cannot turn in every direction with the same facility as our pack-saddle mules; and thus the latter are infinitely superior in the field of battle, and also in a mountainous country, or in one which is difficult of access.

In our army, when it is required to transport such of the sick as a horizontal position is necessary to, litters are employed, which are also carried by mules. For the discharge of the sick and wounded from the provisional ambulance into

\* It is very evident that the writer of this article had never seen the waggon which he professes to describe with so much accuracy, or he would not have used the expression "*painful method*." All means which human ingenuity could devise were employed, in order to obtain an easy motion; and it was acknowledged by all those persons who subjected themselves to the experiment of being conveyed in the waggons that Mr. Holmes, the well-known carriage-builder, had been eminently successful in his efforts.

The writer also shows that he was unacquainted with the construction and capabilities of the vehicle, when, in the next paragraph, he gives it to be understood, at least by implication, that the wounded transported therein will be denied the benefit of pure air and daylight—an impossibility, inasmuch as each compartment is fitted with a Venetian shutter, extending its entire length, so that the interior may be aired and lighted to any extent that is considered desirable.



a regular hospital, our military waggons (*caissons*), hung on springs, are employed, with still more success than the English vehicle; for in ours, the sick soldier has at least the benefit of pure air and daylight.

We have said that at all times the attendant soldiers (*soldats infirmiers*) remove the wounded from the field of battle under the direction of the officers of administration for the hospital service, and under the *surveillance* of the deputy military intendants; and we think that a few more special particulars on this important subject will not be out of place here.

In our army, the surgeons are not required to burden themselves with any care relative to the organization and administration of the material of the hospitals and ambulances. Devoted entirely to the exercise of their noble calling, they practise it with a power the most supreme. The dispenser is at their side, ready to make up their pharmaceutical prescriptions; the officer of administration directs the employment of the material, and carries out alimentary prescriptions, of which he bears the responsibility.

The *infirmiers* (attendants), selected from the best-intentioned men amongst the troops, or from the young soldiers of the annual contingent, previously instructed in the military hospitals in all the duties of the holy mission which is entrusted to them, are all men of intelligence and feeling, all robust and well-framed: they are really the choice soldiers (*soldats de l'élite*).

Over all these, is the superintending military officer (*officier de l'intendance militaire*), who, according to the



orders which have been transmitted to him, directs the movement of the staff and the material of the ambulance, and orders the wounded to the temporary or permanent hospitals established by the military administrative, which are likewise under his authority.

In this organization, as complete as it possibly can be, every one has his share of action, of authority, and of responsibility. The man of science, as he should be, is the absolute master at the bedside of the sick. The dispenser and administrative officer, whilst they are called upon to comply with the prescriptions of the surgeon within such limits as the regulations have marked out, are, however, in no way subordinate to his authority, for they are both of them accountable and responsible. If they are involved in doubts, or disputes, they must refer to the deputy military intendant, whose decision is law to each.

Hitherto the *service*, and that is the essential, has worked well in France under these regulations of duties, against which only a few irritable grumblers have raised their voices. Let us compare the results in the two armies, and then pronounce an opinion on the respective merits of the two systems that are followed.

We will complete our explanations by giving a rapid summary of the resources which our military administrative has allotted to the army in the East, for carrying out the hospital arrangements.

Each corps possesses a surgeon and an assistant-surgeon, who have at their disposal for each battalion, or for two squadrons, an ambulance bag (*sac*), capable of being carried



wherever it is most needed, and a pair of chests furnished with drugs, lint, and everything necessary for the treatment of two hundred wounded.

If the corps makes any prolonged stay in camp, or elsewhere, a regimental infirmary is formed, and the magazines of reserve furnish for that purpose all the elements of organization.

Each division, or each detached brigade possesses, in addition, and in conjunction with the materials above mentioned, a regular ambulance, the materials of which belonging to two different sources, have been combined upon the spot, by the competent authority, in such a manner as to answer to the wants of the regiment consequent upon the greater or lesser amount of movement in the corps forming the division, or the detached brigade.

One of these sources is the organization of the ambulance of the army of Africa, the *materiel* of which is transported on the backs of mules ; the other is the organization of the regular ambulances borne on waggons. In the combination of these two means, the latter serves as a reserve to the former, and is more particularly attached to the service of the advance post, or of the first line. The conjunction of these waggons forms a species of temporary hospital.

The moveable ambulance of Africa for a division of ten thousand men is composed of the following staff and material :—

*Staff in its different ranks.*

16 Surgeons and Dispensers.

7 Officers of Administration.

104 Hospital Attendants (*Infirmiers*).



*Material.*

- 8 Surgical chests, each containing 338 dressings.
- 4 Medical chests for drugs.
- 4 Chests of administration for material.
- 18 Reserve chests for the service of health.
- 22 Chests for the administrative service.
- 26 Chests (personal), for medical and administrative officers,  
&c.
- 10 Casks of Ptizan.
- 20 Hand litters (*brancards*).
- 200 Blankets.
- 50 Cart tilts for the sick, &c. (*bâches pour les malades, &c.*)
- 30 Tents.
- 24 Litters.
- 250 Pairs of seats (*cacolets*).

The whole resources amount to 6,500 dressings, distributed in the various chests for actual use, and in those of the reserve. The transport of all this material requires 364 pack-saddle mules.

The material of a regular ambulance for a division of ten thousand men is composed of five waggons, each carrying 2,000 dressings, and all the elements of a small hospital. The ambulance of a division of cavalry is only composed of three waggons. Each waggon is drawn by four horses.

The military administration of the army in the East possesses twenty-five waggons of ambulance so furnished.

To sum up, the total medical and hospital staff attached to the French army in the East is composed of—



276 Surgeons and Dispensers.

54 Officers of Administration.

50 Sisters of Charity (nurses for hospitals).

751 Infirmiers.

With respect to the material, independently of the resources of the interior service of the corps, and active ambulances, there has been already despatched from France, for the establishment of permanent hospitals at different places, a complete material for 7,700 sick; and this is irrespective of the establishment of a hospital at the Piræus, capable of accommodating five hundred sick. At the present time, a complete material for the organization of two new hospitals, for the reception of five hundred sick each, is being despatched; five hundred being the number chosen to represent the unity of each hospital. In short, large reserves of various objects have been organized, and more especially dressings.

With the aid of these supplies, we may reckon upon resources sufficient to provide 200,000 dressings. Nevertheless, from day to day ships leave France, to the reserve store established at Constantinople, with new supplies for the use of the service.

In the first instance, 1,000 iron bedsteads only were sent out, the temporary hospitals merely carrying mattresses, furnished with sheets, coverlids, &c.; but in consequence of successive supplies, the number of iron bedsteads amounts at present to 4,000, and will soon reach 8,000 or 10,000; so that the hospitals in the East have no cause to envy those of Europe.



The dispensing service is organized in the same manner as the administration, and is provided not only with drugs, but also with every material that is requisite. A central dépôt, established at Constantinople, is furnished with every provision for replenishing the local stores.

The arrangements made for some years past by the military administration for regulating the method of packing the different classes of *matériel* required for hospital service, gives moreover every facility for determining before-hand the nature and importance of the means of transport required by each supply. The dimensions, the contents, and the weight, of each case are settled, hence results great facility for the rapid and sure despatch of this material. Thus, for a temporary hospital of five hundred sick, are required:—

Administrative material in all, 55 metres cube.\* Total weight, 15,000 kilogrammes.†

Pharmaceutical material in all, 9 metres cube. Total weight, 1,800 kilogrammes.

Every hospital of five hundred sick is provided with drugs for three months.

As for the alimentary requisites, which the administration of the hospitals procures in a great measure upon the spot, the central administration occupies itself with the means of procuring for the sick a proper allowance of such special food as agrees with them, by establishing at the reserve dépôt at Constantinople considerable stores of vegetables, preserved by Chollet's process.

\* A metre is 39·3702 inches.

† A kilogramme is 2lbs. 3 oz. 5 dwts. 13 gr. avoirdupois.



These details, the interest of which will doubtless excuse their length, bear the highest testimony to the enlightened care bestowed by his Excellency the Minister at War upon the perfect performance of the important duties of the hospitals, and upon the health of the troops, an object of constant solicitude to the Emperor. They prove, also, that the administration of war in all its movements justifies the confidence of the minister, and that in that respect, also, it is enabled to present to foreign armies some principles worthy of imitation, and examples worthy to be followed.

HAUSSMAN.



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No. 32.

THE BRITISH ARMY

AND

MISS NIGHTINGALE.



THE CHINESE WAR  
THE BRITISH ARMY  
MISS NIGHTINGALE  
THE BRITISH ARMY

It is necessary to state that this short Treatise was originally written in French: this will account for many details and observations on French Hospitals, etc., which may however be applied with equal justice to those of other countries.

MISS NIGHTINGALE  
PARIS  
NEW YORK  
NEW YORK



THE CRIMEAN WAR.

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# THE BRITISH ARMY

AND

## MISS NIGHTINGALE

BY

CHARLES SHRIMPTON, M.D.

LATE SURGEON MAJOR (FRENCH ARMY),

Late Surgeon in Chief of Field Hospitals and of the Military Hospital, Sétif, Algeria.

Knight of the Legion of Honour, etc.

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# THE CRIMEAN WAR.

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## THE BRITISH ARMY

AND

## MISS NIGHTINGALE.

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"When pain and anguish wring the brow,  
A ministering angel thou!"

*"Marmion."*

Now that the rapid course of time appears to be accelerated by a succession of serious events, which crowd one upon another so quickly that the interests and emotions of one moment have scarcely time to make their impression before they are effaced by others, it may be thought almost out of season to revive the distress and anxieties incident to the Crimean War.

So many remarkable men, moreover, have written on this war—some, as historians, to celebrate and transmit to future ages the success and glorious "faits d'armes" of the allied armies—others, as scientific men, to obtain all the important instruction that could be derived for the advancement of Medical Science, or for the perfection of the art of War—that it may be asked whether our undertaking, at the present day, may not be the



simple repetition of a subject already exhausted? But we would reply, that although so much has been done, the subject we have before us is of such a nature, that it can never lose anything of its novelty—that it must always command attention and excite real interest. And although we by no means pretend to the discovery of anything new, still we think that our efforts will not be misemployed, if we submit the circumstances of this most eventful period to a fresh examination, so as to recall attention to the serious instruction they convey with regard to the future.

The present enquiry, indeed, could not have been undertaken, until the very eminent men, particularly those of the Medical Profession, who by their high military position are best able to give us the most complete information, had written on this subject. It is principally to their labours that we shall have to refer, and we have great reason to fear that the intrinsic value of their instruction has not been appreciated as it should have been.

May we, then, be permitted, in the cause of humanity, to apply ourselves, to the extent of our power, to reproducing the fatal consequences of errors now almost effaced from the public mind, since, by so doing, we hope to prevent the return of misfortunes much more disastrous even than those of actual warfare!

It is one of the greatest characteristics of the present age, that the cause of humanity is become identified with the strength of armies. The history, then, of a war can no longer be confined to bare details of the plans of battles, and of the manœuvres of armies: we must refer to other elements, and principally to the sanitary condition of troops, as the causes of our victories, or the reasons for our disasters. The historian, in following soldiers in their campaigns, should note



everything that may be favourable or unfavourable to their sanitary condition; and consequently he should not neglect any opportunity of exposing every error that may be committed on this important point, from whatsoever source it may spring. There are, particularly, two important results to be obtained from this scrupulous care in compiling the history of a war. The first is, that of reducing to less than half the mortality of those brave soldiers who so generously shed their blood for their country; the second, merely a corollary of the first, that by reducing the mortality of soldiers, the strength of armies will be proportionably increased, and thus very often the fortune of war decided.

We must give a just tribute of praise to the English Press, which has established the precedent of a philanthropic measure unknown, we believe, till the present day, but to be renewed, we hope, in all analogous circumstances. The English Press, in sending its correspondents to the British army in the Crimea, was in a position to know and point out all the disorder that existed therein from the very beginning of the campaign. We were thus warned of the misfortunes that were to assail us, and which would have been much greater but for this salutary information. Though the presence of the correspondents of the Press in the army may appear somewhat at variance with military feeling, we are persuaded that the judgment and discretion of these gentlemen, far from compromising the success of campaigns, would serve only to strengthen the army, by making the soldier feel that he is supported by all the resources and sympathy of his country. Who can estimate or sufficiently appreciate the services of Mr. W. H. Russell, the correspondent of the *Times*? By his correspondence, the authorities were somewhat embarrassed, it is true—they were obliged to see and know



things as they really were. This was the great step towards the remedy. The army was, most probably, saved by this means. We are not at all aware that his correspondence, whilst rendering this essential service, gave any advantage to the enemy by its contents. In undertaking this delicate mission, not only did he devote his rare talents to his country, but, with the highest spirit of self-denial and patriotism, this talented writer accompanied the army in all its movements, and frequently exposed himself to the dangers of the war, so that he might see and observe everything with his own eyes. Whilst he was writing those admirable letters which were read with such thrilling interest, he could in truth apply to himself the words which the Roman poet puts in the mouth of his hero,

. . . . . Quæque ipse miserrima vidi,  
*Et quorum pars magna fui.*

After these necessary preliminaries, we will enquire, first, why the fine troops, which left England in such admirable condition that the highest hopes were legitimately formed of their success, should have been exposed to such difficulties and privations from the very beginning of the expedition, that they were almost swept away by disease and death, even before they came in presence of the enemy.

Secondly, we shall enquire, how the presence of Miss Nightingale in the Hospitals of the British army could so promptly assuage so much suffering, and so effectually stop the ravages of those frightful diseases, the focus of which was in the Hospitals, carrying off all the inmates.

We shall endeavour, thirdly, to point out the causes to which we must attribute the happy change that took place in the sanitary condition of the English troops



towards the end of the war—a change so vital as to insure their complete immunity from Typhus fever, at the very time that this dire disease raged with the utmost violence amongst the French and Sardinian troops encamped in their immediate vicinity.

With regard to the duration of the Crimean War, we shall have occasion to show, that the prolongation of this war, with its enormous sacrifice of money and men; was the result of sickness, quite independent of the effects of the war itself : and that as regards the British army in particular, its soldiers would have been almost entirely exempt from those diseases to which they became a prey, if, from the beginning of the campaign, they had been accompanied by a good military administration (1).

The British troops left England in the most promising condition, and reached Malta on March 7th, 1854, in the highest possible sanitary state, after a most prosperous voyage. But immediately on their arrival they had to encounter difficulties and embarrassments of all kinds, in some cases even privations, for many things were absolutely wanting, others were not to be found when required, and there was not even a sufficient quantity of meat for the troops. Demands and loud complaints were consequently raised on all sides.

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(1) As we shall often have to refer to the Military Administration of the Army, it may be advisable to explain as briefly as possible what is here meant by this expression. We would convey the idea of a regularly organized Military Service of all the different branches of the Administration : Victualling, Clothing, Forage, Hospitals, Campment, Transport Service, and a Corps of Workmen. All and each of these branches having their own officers, non-commissioned officers and men, should be trained and accustomed to their duties, like the different corps of the army, with one special chief to command them all and make them work together as the service may require.



Whence arose this sad disorder, so unfavourable an omen for the beginning of an expedition? From the Military Administration, whose duty it is to provide for all the wants of an army. The absence of centralisation of the different branches of this most important service, and consequently their not working together, rendered it impossible to satisfy all demands. The Commissariat was, however, most active, and anxious in its endeavours to do its duty, but there was not a sufficient staff for this service.

This should have been known before—it was not *then* the proper time to discover the fundamental defects of the administration. It was, however, urgent that the staff should be increased, and clerks were immediately recruited amongst the Maltese. But even this effort was made in vain, for these new clerks were so unfit for the service, that, with all the good will in the world, they could not fulfil the duties of their mission, and often occasioned embarrassments instead of rendering assistance. The functionaries of an administration, particularly of a Military Administration, and in time of war, cannot be created at will in this way.

The administration of an army in campaign must be complete in all its departments, and must be organized so as to satisfy all the requirements of the service with ease and promptitude. It must have all its stores prepared beforehand, and have them placed in the best situations for the convenience of the service. When troops are once on the march, they should want for nothing, their movements should not be embarrassed in any way. Everything, on the contrary, should be done to facilitate their action, and to provide immediately for all their necessities. This may always be the case in an army provided with such an administration as we have described—always ready to march with the army, or



with any fraction of the army, and prepared to meet all difficulties as they may arise.

It is impossible that a General in Chief, who is absorbed by his meditations on plans of battle and by the multitude of duties inseparable from the position of a Commander in Chief, can enter into the details of Military Administration. He can never give anything more than a general order, confiding the measures to be taken, and all the administrative duties, to a special chief, who alone must be answerable for the service of the whole Administration.

Thence the necessity of a special chief, armed with full authority over the whole service of Administration, such as we see in the French army, under the title of "*Intendant Général*." In the French army, every branch of the Military Administration—Provisions, Forage, Transports, Hospital, Encampment—has its own separate and independent organization, but all these different branches are concentrated under the authority and direction of the special chief just named, who is responsible for the whole service of the Administration, and who makes all work together according to the requirements of the army and the directions of the Commander in Chief.

At the beginning of the Crimean War, the British army, prepared only for the requirements of a garrison life, was far from being as well organized as the French with regard to its Military Administration. We are obliged to make this comparison, to be enabled to point out the absence, in the British army, of centralisation and of the working together of all the different branches of this administration, as the causes of its inefficiency from the very beginning. If we have laid so much stress on these explanations, and if we return to them again, it is because the British army must attribute to the de-



fective state of its Military Administration, not only the first difficulties and embarrassments it had to encounter at Malta, but almost all the other difficulties which occurred, and all the misfortunes by which it was afterwards overtaken. Yes, to this radical defect we must attribute by far the greater part of the troubles and afflictions by which it was overwhelmed—even the frightful mortality which decimated it from the very beginning of the campaign. The improvidence—the inevitable consequence of such a defective organization of Military Administration—surpasses all conception. Could it be believed that the British army could reach its destination without having been preceded by any officers to make preparations for its arrival? Even Malta, a British colony, was taken by surprise by the arrival of English troops, and at Gallipoli the same neglect was repeated—the British consul there was not officially informed that English troops were to arrive!

Before we proceed farther, we must make an important observation on another branch of the Military Service. We have just said that almost all the sufferings the British army had to endure, from the very commencement of the war, were the consequences of the very defective organization of the Military Administration. We must here add, that the organization of the Medical Department was so imperfect at the beginning of the war, that this branch of the service suffered also very considerably. Dr. A. Smith, the Director General of the army Medical Department, most nobly admits the imperfect state of this service in his admirable work, “Medical and Surgical History of the Crimean War.”

“When it was determined in 1854,” says Dr. A. Smith, “that a military force should leave this country and proceed up the Mediterranean, to aid the Turks, should it be necessary, in resisting the advance of a



Russian army then threatening Bulgaria, I was required to immediately provide an adequate medical staff, and the amount of stores likely to be wanted for Hospital purposes. If I had been given to understand, when I received this intimation, that the troops were to be employed on the duties which are usually exacted of soldiers in times of peace, I should have had no difficulty in deciding what I ought to furnish, but the having been on the contrary led to expect that they would probably soon be engaged in the field, in conflict with an enemy, caused me both much consideration and anxiety, the more especially as neither myself, nor any of the officers of the Department, had from personal experience, a knowledge of all that would probably be found necessary for the wants of the sick and wounded during a European war."

This remarkable statement is contained in the first paragraph of the Preface to the "Medical and Surgical History of the Crimean War," a work evidently undertaken for the express purpose of preventing the recurrence of anything of the kind in the British army, and as such, it will always remain a monument of science for the guide and assistance of Medical Men in all future wars.

Returning now to the observations we were making on the Military Administration, we will endeavour to show the advantages of a good Administration by the very opposite results obtained in the allied armies.

The French army landed in a few hours, and was quickly established with great regularity and order at Gallipoli. The English troops employed three days in landing, and when they did land they were most miserably situated, they had neither mattresses nor blankets for the men, nor medicines for the sick—all this had been left at Malta! Mr. Russell, whom we



shall often have occasion to quote, tells us that "Mr. Alexander, the senior staff-surgeon, with commendable activity, succeeded in getting hold of some hundreds of blankets by taking on himself the responsibility of giving a receipt for them, and taking them off the hands of the commanding officer of one of the regiments at Malta." There was no shelter or comfort of any kind for the sick, which had been foreseen by Mr. Alexander, but what could the efforts of an isolated medical officer avail in an army? It must not be supposed that this painful disorder existed only on the first landing of the troops. Difficulties and privations of all kinds increased, on the contrary, in the British army, as the troops landed, whilst the French had no difficulty nor any kind of privation to meet, because everything had been provided and settled for them by their "Intendant Général." The "Train des Équipages Militaires" took charge of their baggage and all the stores they required. As there was no special service of this kind in the British army, they had to wait until "Arabas," a miserable kind of cart, could be procured at great expense and with much difficulty. After all this delay and trouble, there was nothing but confusion and disorder. The distribution of provisions was so irregular and so difficult that often the men could not get any meat at all. The soldiers of the 93rd were obliged to kill the oxen which had brought their baggage on the "Arabas" to procure meat for themselves!

How can we account for such want of care and provision? There was not a thought bestowed even on the most urgent necessities—no arrangement was made for the purchase even of things which the army was obliged to procure for themselves every day. The "French Commandant de Place" had agreed with the Turkish Authorities on a moderate tariff at which the natives



should sell their provisions. "The French Commandant de Place," says Mr. Russell, "posted a tariff of all articles which the men were likely to want on the walls of the town, and regulated the exchanges like a local Rothschild. A Zouave wanted a fowl; he saw one in the hand of an itinerant poultry-merchant, and he at once seized the bird, and, giving the proprietor a franc—the tariff price—walked off with the prize. The Englishman, on the contrary, more considerate and less protected, was left to make hard bargains, and generally paid 20 or 25 per cent. more than his ally."

When at Varna, the allied armies were obliged to give up a most important expedition on the Danube, because they could not procure sufficient means of transport. They required at least 4,000 "Arabas" for the transport of the victualling alone of 100,000 men, for four days only, and besides this a great number more would have been required for the transport of tents and all Hospital requirements. The British army had procured a great number of beasts of burden for this abortive expedition, and as there was no one whose special duty it was to command and regulate these matters, all these cattle were left to die of hunger at Varna, at the very time that the army itself was nearly perishing through the absence of these animals, which would have supplied their wants by the transport of provisions between Balaclava and the camp before Sebastopol.

The frightful mortality that took place in the allied armies was one of the great causes which hastened the departure from Varna. This beautiful and fertile country was known to be excessively unhealthy, particularly those spots which were so imprudently chosen for the camps. The air there is so pestilential that the country bears the significant name of "The Valley of



Death." Everything seemed to be combined here to produce the most deleterious effect on the soldiers, who could not be protected by their tents either from the burning heat of day or from the pernicious atmosphere of night. As soon as the sun set, during the hot season, pestiferous vapours rose from the earth, rapidly covering the whole country, and enveloping the soldier in his tent as with a mantle of death.

In the morning, shortly after sunrise, as soon as the atmosphere became sufficiently heated, this pestiferous vapour gradually rose in the atmosphere, assuming the form of a thick dense cloud, and it was but too easy to judge of its effects upon the soldiers, who, wrapped in their blankets saturated with this slimy vapour, shivered with the cold, and with their aching limbs sighed for the rays of the sun to recover from their state of prostration. Such was the position of the soldier, who had no means of escaping the alternation of the burning heat of day and the pestiferous atmosphere of night, during upwards of sixty days. Add to this the enormous quantity of fruit, which the soldiers so easily procured and rapidly devoured. Was it astonishing that, under such circumstances, the cortege of malarious fevers was so soon to be completed by the apparition of Cholera? This dreadful disease first attacked the French troops, but it soon appeared amongst the English soldiers exercising its fearful ravages. The number of sick increased rapidly every day. From 566 in June, it rose to 1,099 in July, and reached 2,558 in August. The mortality increased of course in the same proportion, and as it was impossible to shut men's eyes to this frightful state of things, it was decided that the allied armies should fly from this deadly spot. The order for departure was received on September 4th with great joy by the troops, who were suffering as much from moral depression as from



disease. There was no time to be lost, for, on landing at Eupatoria, they were obliged to leave a great number of sick on board, though the sanitary state of the army had improved considerably during the voyage, and many cases of Cholera continued to appear amongst the troops after the landing.

It is painful to state that the English soldier was not in any way prepared for landing when he reached Eupatoria, and he had again to undergo a great deal of the suffering he had endured at Malta and Gallipoli. The rain commenced soon after the landing, and continued in torrents during the whole of the night. The soldiers had no shelter, nor could they make any fire. The suffering was very great, sending 1,500 more sick on board the vessels they had left the day before. It is useful here to remark that the French army suffered but very little in comparison with the English troops, for they were protected by the small tents they carry everywhere with them on their knapsacks.

The distress and misery which our troops had to undergo during this terrible night are so well described by the graphic pen of Mr. Russell that we must quote himself : " Few of those who were with the expedition will forget the night of the 14th of September. Seldom or never were 27,000 Englishmen more miserable. No tents had been sent on shore, partly because there had been no time to land them, partly because there was no certainty of our being able to find carriage for them in case of a move. Towards night the sky looked very black and lowering, the wind rose, and the rain fell in torrents. The showers increased in violence about midnight, and early in the morning fell in drenching sheets which pierced through the blankets and great coats of the houseless and tentless soldiers. It was their first bivouac—a hard trial enough in all conscience, worse



than all their experiences of Bulgaria, or Gallipoli, for there they had their tents, and now they learned to value their canvass coverings at their true worth. Let the reader imagine some of these old Generals, and young Lords and gentlemen, exposed hour after hour to the violence of the pitiless storms, with no bed but the reeking puddle under the saturated blankets, or bits of useless water-proof wrappers, and the twenty odd thousand poor fellows who could not get 'dry bits' of ground, and had to sleep, or try to sleep, in little locks and water courses—no fire to cheer them, no hot grog, and the prospect of no breakfast—let him imagine this, and add to it, that the 'nice change of linen' had become a wet abomination which weighed the poor men's kits down, and he will admit that this 'seasoning' was of rather a violent character—particularly as it came after all the luxuries of dry ship-stowage."

The battle of the Alma was soon to follow upon this; the valour of our troops was roused to the highest pitch, and the enemy was quickly routed. Why was the victory not complete? *It was not*, and this is one of the principal observations we wish to make. If the great exhaustion of the soldier and the thinning of the ranks of the army by so much disease—the Cholera still continued its ravages—did not prevent the allied armies from fighting with their accustomed valour, and from gaining a great victory, it is also true that they were unable to pursue their advantage from their utter inability to move. We have the proof of this in Mr. Russell's correspondence. He says, "All the Russian officers with whom I have conversed, all the testimony I have heard or read, coincide on these two points—first, that if on the 25th we had moved to Backschiserai in pursuit of the Russians, we should have found their



army in a state of the most complete demoralisation, and might have forced the greater majority of them to surrender as prisoners of war, in a sort of *cul-de-sac*, from which but few could have escaped. Secondly, that had we advanced directly against Sebastopol, the town would have surrendered after some slight show of resistance in order to save the honour of the officers. The deduction from these propositions is, that the flank march was the certain precursor of a long siege, of bloody battles, and of great losses." The correspondent of the *Times* says again, "Had our army marched upon the place on the 25th September, it would have fallen almost without resistance. A Russian officer who was taken prisoner some little time before, and who knew the state of the city well, declared that he could not account for our 'infatuation,' in allowing the Russians to throw up works and regain heart, when we could have walked into the place; unless under the supposition that the hand of the Almighty was in it, and that he had blinded the vision and perverted the judgment of our Generals. 'And now,' said he, 'He has saved Sebastopol, and we, with His help, will maintain it inviolate.'"

It is evident then that the allied armies did not obtain the advantages they ought to have reaped after the victory of the Alma. And why was this? The enemy certainly did not prevent them from doing everything they could. The defeat was so complete that even several days after the battle the Russians could not rally sufficiently to offer the least resistance to the English and French troops, whilst they were marching on Sebastopol through woods and the most uneven ground. The vanquished had every opportunity and shelter offered them, from whence they might have harassed their foe almost with impunity, and if they did



not profit by such advantages, it could only be because they could not make the least effort.

Since, then, the allied armies met with no resistance, and yet did not pursue the Russians and take Sebastopol after the victory, there must have been some insuperable difficulty to account for their inaction.

The reason for this inaction was variously assigned—every one accounted for it according to his own ideas, views, and prejudices, as is always the case when the true reason is not given. The true reason, and there is none other, is that the exhaustion of the soldiers and the diminution of their ranks, much more by disease than by battle—the Cholera was still raging—arrested them in their career of victory. How is it possible otherwise to account for the facility with which the allies allowed the Russians to retire and to fortify themselves in Sebastopol? To suppose that the commanding officers could have been in fault at this particular juncture would simply be an absurdity.

Thus we see that the British camp, having been so considerably weakened by exhaustion, diseases, and deaths, which in themselves required all the energy and self-reliance of the soldier to sustain his national valour, was arrested in its course of victory, and the war was to continue eighteen months longer, at an enormous cost, and with an immense sacrifice of life! Is it not awful to think that all this was the consequence of errors committed at the beginning of the campaign, when the troops should have been inured to the hardships of war, instead of being exhausted before they were brought to face the enemy?

Can there be any excuse for such want of foresight in allowing an army to go forth without being supplied with all that the emergencies of war might require? We do not and we cannot lay



the blame on the Commissariat, which, from its defective organization, was the cause of so much disappointment and disaster. The Commissariat was the victim, and had all the burden to bear; the blame lies at the door of the House of Commons for having allowed itself to be governed by the miserable calculations of a false and ruinous economy which imposed this defective Administration on the army. The Commissariat was absolutely powerless. We have only to remember what took place at Balaclava, whither all the supplies of the army were brought. Everything was taken there in abundance, but there was no one there officially appointed to receive them, or to whom they could be addressed. The consequence was, that vast quantities of stores were lost, or destroyed, by having been abandoned on the Quay. Frequently they were carried away again, after long delays, as no person could be found who was authorised to relieve the vessels of their cargoes.

All the consequences of this defective state of the Administration were well known to Lord Raglan, who had struggled with all his might against these false notions of economy. In accepting the command of the British army, he made every effort to repair the disastrous consequences of a system he disapproved of. He undertook a most arduous and painful duty, but the task was too great, and overpowered by the labour, he became the victim of his heroic patriotism.

The Ministers could in no wise be answerable for the misfortunes which overtook the British army. The fault is easily traced to the principle itself of a Constitutional Government. Every one knows that the House of Commons governs the whole country, and that when it has pronounced its opinion by the majority of votes, the Ministers are expected faithfully to execute its resolu-



tions. As the House of Commons had not before it the painful lessons of experience, it was swayed by the calculations of economy, and this was especially the case in all matters concerning Military Administration. The deplorable consequences were irretrievable. We say irretrievable, because there is no time for reforms and improvements in time of war. When the troops are actually fighting, everything must be made the best use of as it is. It was impossible, and even had it been possible it would have been most imprudent, to attempt any kind of reform when the war had once begun; but everything that could be done, was done promptly and generously, as soon as the sufferings of the British army were known in England. The Government and the whole nation vied with each other in making every effort to come to the relief of the soldier. Even the economists were not behind in their endeavours to repair the mischief they themselves had occasioned.

Everything was supplied in abundance, and it will appear strange to a person unacquainted with what an Administration should be, that the army should still have been in want of everything. Things were not within reach when required, and when they were within reach, so many formalities were required that the army had to suffer the torture of Tantalus. The Administration had no initiative power, it was nothing more than a dispensing instrument. Such as it was, however, it was allowed to do its best. The functionaries, with all their zeal and activity, could not overcome the radical defect of their organization, but every kind of assistance possible was given them. This was not sufficient, for we were soon to see another administrative power rise, which, without interfering at all with the original Administration, aided and assisted in supplying many great deficiencies which the regulations had not pro-



vided for. This was the mission of Miss Nightingale, who came, in her sublime vocation, to work out the most wonderful reforms in the British Hospitals in the East.

Before we proceed farther, we must make an observation on the peculiar causes which rendered it extremely difficult for the Government to know the true state of things in the army. This was hidden as much as possible from Lord Raglan, and kept from the Government altogether. The Government could not believe the reports, as they were not confirmed by the military authorities, stating that the army was threatened with entire annihilation. How was it that this truth did reach the Government at last? Through the Press. Yes! thanks to the faithful perseverance of the correspondents of the public papers, the Government was at length obliged to believe that the sufferings of the army were but too real, and earnestly sought to remedy the evil. Thus are we not only justified in the praises we have given to the English Press for their initiative in sending their correspondents to the army; but this is a noble proof of the advantages of the liberty of the Press—not one of the least blessings of a Constitutional Government.

Our subject has confined us, hitherto, to the relation of the sufferings of the British army, on landing and in camp, from the effects of the defective state of the organization of the Military Administration. We have now to speak of the painful and disastrous state of the sick in the Hospitals.

From the 1st December, 1854, to the 20th January, 1855, eight thousand sick were carried on "Litières" and "Cacolets," lent by the French Administration, from the camp before Sebastopol to Balaclava, where they were embarked for Scutari, and arrived after a



most fatiguing voyage of seven or eight days. These unfortunate men were crowded together to such a degree that it was often impossible to get near them to attend to their wants. A great number died on their passage and were thrown overboard, of whom no account could be taken, and when those who survived the passage arrived, they were without their kits, and almost without clothing. A great number were dying, and could not tell either their names or the Regiments to which they belonged!

The Hospitals were crowded—in the Barrack Hospital the sick were laid side by side on straw mattresses which touched each other, leaving room for two persons only to pass each other between the ends of the mattresses. Seventy-two patients were put in a ward where scarcely thirty beds could be placed. During six weeks 2,000 sick were crowded in a space scarcely sufficient for 4,220. Such a crowding together of patients was inevitably the cause of great mortality. But the evil was still further increased by the complete neglect of all hygienic care. There was no possibility of changing the air of the wards but by opening the windows, and this they were afraid to do. It is impossible to describe the state of the atmosphere in the wards, particularly during the night. The air was vitiated in the highest degree—there was no drainage for the water and filth—no possibility of escaping the horrid smell from the privies, which filled the passages and entered the wards. The floors were always wet and saturated with filth—the walls and ceilings were also saturated with putrid animal matter; rats and vermin swarmed everywhere, and, as there were no night-vessels, large tubs were placed in the wards to supply their deficiency! After such an account of the interior, it is scarcely worth while to speak of the exterior of the Hospital. The same



want of care reigned everywhere. Dead dogs, in a state of putrefaction, were to be seen under the windows of one Hospital, and the carcass of a horse was found in the aqueduct of another.

A frightful mortality was the natural consequence of this state of things. And if the same rate of mortality had continued during the whole year, as in the month of February, the whole Hospital population would have been swept off more than four times in the course of the year. The proportion of deaths to the whole army was 60 per cent., from disease alone; “a rate of mortality,” says Miss Nightingale, “which exceeds that of the great plague in the population of London, and a higher ratio than the mortality in Cholera to the attacks; that is to say, that there died out of the army in the Crimea an annual rate greater than ordinarily die in time of pestilence out of sick.”

Such an agglomeration of patients, and such a fearful state of things, required the incessant care of a vast number of Medical Men. In fact, no number could have sufficed, shackled as they were, and we believe still are, by a multitude of duties quite foreign to those of their profession. They had to see to all Hospital arrangements—the enregistering of the patients—the care and cleanliness of the wards—the superintendence and responsibility attendant on the victualling—the furniture of the Hospital, etc., etc. All these duties and responsibilities are the natural attributions of the Military Administration, with which the medical officer should not be obliged to interfere.

At all times, particularly in time of war or epidemic influence, a medical man cannot bestow a moment or a thought on anything but his professional duties. All the charges that we have just mentioned are inseparable from questions of detail, discussions, and struggles of



interest, which must withdraw him from the anxious and unremitting labours which his vocation incessantly demands.

In the French army everything connected with Hospital management belongs to the Department of the Administration. The medical officer has nothing to do with anything but his professional duties, transmitting his prescriptions to the "*officier d'administration comptable*." Thus the French medical officer is enabled to attend to 300 patients, more promptly and efficiently than the medical officer of the British army can attend to 30.

We have seen the consequences of the unhappy concurrence in the British army of so many disastrous influences. The whole country was suddenly roused from its confidence and repose to a sad state of anxiety. Miss Nightingale, on inquiring into the extent of the sufferings of the British army, saw at once the source from which it all sprang, and, animated by the spirit of her vocation, wrote immediately to the Honorable Sidney Herbert, Secretary of State of the War Department, offering her services. By a very curious coincidence, Miss Nightingale received a letter from Mr. Sidney Herbert, which must have crossed her own, partaking entirely of her own views, and asking her to undertake the noble mission for which she had offered herself. From this letter of Mr. Sidney Herbert, which, through the indiscretion of a friend, appeared in the public papers at the time, and has since been published by Dr. Pincoff in his interesting work on Eastern Military Hospitals, we are enabled to give some extracts, showing at the same time the solicitude of the Government, and the legitimate hopes that were founded on Miss Nightingale's administrative power.



“You will have seen in the papers that there is a great deficiency of nurses at the Hospital at Scutari.

“But the deficiency of female nurses is undoubted, none but male nurses having ever been admitted to Military Hospitals. It would be impossible to carry about a large staff of female nurses with our army into the field. But at Scutari, having now a fixed Hospital, no military reason exists against the introduction, and I am confident they may be introduced with great benefit, for Hospital orderlies must be very rough hands, and most of them, on such an occasion as this, most inexperienced ones.

“There is but one person in England, that I know of, who would be capable of organizing and superintending such a scheme, and I have been several times on the point of asking you hypothetically, if, supposing the attempt were made, you would undertake to direct it. The selection of the rank and file of nurses will be very difficult; no one knows that better than yourself. The difficulty of finding women equal to the task, after all, full of horror, and requiring, besides good will, great knowledge and great courage, will be great; the task of ruling them, and introducing system among them, great; and not the least will be the difficulty of making the whole work smoothly with the medical and military authorities out there. This is what makes it so important that the experiment should be carried out by one with administrative capacity and experience. A number of sentimental, enthusiastic ladies, turned loose into the Hospital at Scutari, would probably, after a few days, be ‘*mises à la porte*,’ by those whose business they would interrupt, and whose authority they would dispute. My question simply is, would you listen to the request to go out and supervise the whole thing? You would of course have plenary authority over all



the nurses, and I think I could secure you the fullest assistance and co-operation from the Medical Staff, and you would also have an unlimited power of drawing on the Government for whatever you think requisite for the success of your mission. On this part of the subject the details are too many for a letter, and I reserve it for our meeting, for, whatever decision you take, I know you will give me every assistance and advice. I do not say one word to press you; but I think I must not conceal from you that upon your decision will depend the ultimate success or failure of the plan. Your own personal qualities, your knowledge, and your power of administration, and, among greater things, your rank and position in society, give you advantages in such a work which no other person possesses. If this succeeds, an enormous amount of good will be done now, and to persons deserving everything at our hands, and which will multiply the good to all time.

“Deriving your authority from the Government, your position would ensure the respect and consideration of every one, especially in a service where official rank carries so much weight. This would secure you any attention or comfort on your way out there, together with a complete submission to your orders. I know these things are a matter of indifference to you, except as far as they may further the great object you would have in view, but they are of importance in themselves, and of every importance to those who have a right to take an interest in your personal position and comfort. I know you will come to a right and wise decision. God grant it may be one in accordance with my hopes.”

It would appear by this letter that Mr. Sidney Herbert was not aware of the full extent of the suffering of the army. He saw, however, the urgent necessity of taking



the most active measures, and, in addressing Miss Nightingale, he knew that he would find her ready to meet all difficulties.

But how could the Minister have formed such a high opinion of Miss Nightingale's administrative power as to make a special choice of her in such an emergency—offering her Government authority to act in an army, and this during actual warfare?

How also could Miss Nightingale be prepared to undertake a mission of a nature so delicate and so extremely difficult?

To answer these questions satisfactorily, it will be necessary to discover the source from which so much power and genius sprang, to watch its development, and to see how irresistibly her course was directed. We feel ourselves under the restraint of our respectful submission to Miss Nightingale's constant desire to avoid publicity, and must therefore confine ourselves to such details as have already been published, and such general information as we have been able to gather.

From an interesting publication written by the Rev. T. G. Gifford, we learn that Miss Nightingale was born in the paternal mansion situated on the confines of Hampshire and Wiltshire, near the New Forest, and that she was brought up there with the greatest care. Though she had all the sprightliness of the happy age of childhood, she was remarked as a peculiarly thoughtful child even from a very early age. The predominant feature of her character was to be kind to every one, and to make herself beloved by all who approached her. This happy disposition found ample means of development in the village school, and amongst the country people who lived on the estate. Miss Florence was looked for on all occasions, and was applied to in all cases of suffering, difficulty, and distress. Her lessons



were diligently imparted to the children, her assistance offered with a sympathising hand to the sufferer, and her prudent advice to all who were in trouble. All this is treasured in the hearts of the grateful inhabitants of her birth place, who pride themselves in talking of "Miss Florence."

These good qualities and this happy disposition were a bright presage of future development. Here we have a good example of the immense advantage of having been brought up under the influence, and surrounded by the ties, of family affection. Without doubt it is a great privilege to be endowed with all the gifts of nature, we cannot also appreciate too highly the advantages of a well-directed education, but we believe that however highly endowed a child may be, and however perfect the education, a high degree of attainment can scarcely be hoped for, unless the natural gifts and the education are directed by the watchful care and affection which can be expected only from family ties. All these elements, so admirably combined in Miss Nightingale's favour, contributed to the perfect development of both heart and mind.

For the accomplishment of this promising young lady's education, and in accordance with her own desire to perfect herself as much as possible, she travelled in France, Germany, Italy, everywhere, in fact, where the different elements of her education could be best found.

It is most remarkable that though this young lady made the most wonderful and rapid progress in every branch of her studies, she was always instinctively led to bring all her powers to bear on her secret vocation—her sympathy with suffering of all kinds, and the care which the sick required. Her family had long struggled against this inclination, which was, without doubt, not



thought quite suitable to the usual habits and disposition of young ladies ; but Miss Nightingale was so naturally and so irresistibly attracted, that her family soon gave up all opposition, and allowed her full liberty to follow the bent of her inclinations.

From this moment we find Miss Nightingale concentrating all the faculties of her powerful intellect on the study of the sufferings to which human nature is heir. In the first answers given to questions put to this lady by the Commissioners appointed by Government to inquire into the Regulations affecting the sanitary condition of the army, we find that she had devoted herself to the study of this important subject for thirteen years, and she continues: "I have visited all the Hospitals in London, Dublin, and Edinburgh, many Country Hospitals, some of the Naval and Military Hospitals in England; all the Hospitals in Paris, and studied with the *Sœurs de Charité*; the Institution of Protestant Deaconesses at Kaiserwerth, on the Rhine, where I was twice in training as a nurse; the Hospitals at Berlin, and many others in Germany; at Lyons, Rome, Alexandria, Constantinople, Brussels; also the War Hospitals of the French and Sardinians."

Thus we see how Miss Nightingale acquired such vast superiority, both in the theory and practical experience of Hospital duties, that her knowledge surpasses that of the most eminently scientific men of our day.

This rare knowledge and practical experience were too long unknown, and would have remained so much longer, had not the threatened ruin of the establishment for the reception of poor gentlewomen, in Harley Street, called forth her powerful administrative faculties and her noble generosity. This establishment, for the reception of poor gentlewomen who are obliged to go to London for the best surgical and medical ad-



vice, was in an almost hopeless state when Miss Nightingale, by placing herself at the head of the establishment, and most generously meeting the first difficulties and pecuniary embarrassments, rapidly raised it from its impending ruin to great prosperity and development.

The difficulty of satisfying all demands in cases of embarrassment of this kind—the efforts required to establish order in the midst of confusion—the impulse to be given to the well working of an establishment, in which the medical and surgical assistance had to be secured, as well as all the attendance patients require in illness, and after the most serious operations—all this was done at once, and the establishment was brought to render all the services that could be required of it, thus re-establishing its reputation, and the sources of revenue for its future existence.

Miss Nightingale's success was complete in every way, but the immense fatigue both of body and mind that it occasioned so completely exhausted her already weak state of health, that she was obliged after a time to relinquish the direction of the establishment to other hands, still protecting it by her powerful influence and advice.

Thus Miss Nightingale's name and great administrative power became known throughout England, and, shortly after her retreat, almost before she had time to feel the benefit of the repose she so much required, the news of the disastrous state of the army in the East roused all her patriotism, and called her from her retreat to the noble mission for which she seems secretly to have been prepared by the hand of Providence, to save the honour of her country by coming so opportunely to the assistance of our gallant soldiers.

The delicate state of her health seemed an insuperable obstacle to the immense undertaking she had before



her, but her zeal and the ardent character of her spirit would not allow her to think one moment of herself. She felt that her energetic will would always give her strength, and bear her through all trials and dangers. She assented then to Mr. Sidney Herbert's desire to see her, and after several conferences with the Minister she was prepared for her departure.

Unhampered by any vain theories or any fixed plans, but imbued with pure, unalloyed science, and animated by the true spirit of philanthropy, Miss Nightingale quitted the English shores on the 24th of October, 1854, accompanied by about forty persons who had solicited the honour of being her companions.

We shall soon see her at the height of her vocation, and on an immense field worthy of all her powerful action. Mr. Sidney Herbert, who had not a full knowledge of the extent of the disasters of the British army, could not have a full conception of the duties Miss Nightingale would be called on to undertake, nor of her power, which seemed to develop itself as new emergencies called it forth.

The delicate state of Miss Nightingale's health, when she was going so far from home, and on such a perilous expedition, became a source of very serious anxiety amongst her numerous friends, who obliged her to accept the kind offices of her true and tried friend, Mrs. Bracebridge. This kind lady, who enjoyed her confidence during the whole of the Crimean War, was enabled to attend her with the maternal care and solicitude that she so often needed, when harassed and fatigued beyond what human nature could apparently bear.

The preparation and departure of Miss Nightingale were noised abroad, and, on her arrival at Boulogne-sur-Mer, her little band was surprised by the most



enthusiastic reception. The fish-women, who act as porters in that town, seized their luggage and carried it off, and, with our travellers, were escorted by the population to the Hôtel des Bains, where a most sumptuous repast was prepared. No one would receive any money from those ladies, and they were greatly embarrassed, not being able to express their thanks for such an unexpected reception. Miss Nightingale must, without doubt, have been confused and somewhat vexed, for we find that, after this, every precaution was taken to prevent the repetition of a like ovation. Our interesting travellers, continuing their journey, unperceived and unknown, reached Constantinople on the 4th of November, 1854, and were immediately established in a dependence of the Barrack Hospital.

The presence of Miss Nightingale and her companions had, in some measure, the appearance of a reproach to the way things were going on in the Hospitals, so that they were looked on at first with a certain degree of uneasiness and distrust. Mr. Sidney Herbert had foreseen, as appears from his letter to Miss Nightingale, that the position of the new comers would be extremely delicate and difficult. It required, in fact, the greatest tact and prudence on their part to obtain the confidence, and gradually to conciliate the good will, of every one. With this feeling, they had to set to work immediately, carefully avoiding any interference with other functionaries. Miss Nightingale, too much experienced in such matters to find herself at all embarrassed, saw her way immediately through these first difficulties. There was plenty to be done without interfering with any one. She decided, then, on acting alone, preserving the independence of her own authority, and supplying things, as they might be required, from her own private resources.



Miss Nightingale's attention was first drawn to the urgent necessity of providing light and delicate food for the patients who were extremely ill, and of procuring changes of clean linen for all the sick in the Hospital. This could not be considered by any means an interference: it was merely the supplying of deficiencies—namely by the construction of a private kitchen, “*Miss Nightingale's extra diet kitchen* (1),” and a washing-house with its dependencies, Miss Nightingale providing the greater part of the food which issued from her kitchen, and all that was necessary for the washing establishment. The dirty linen was collected, washed, and carefully put by, so that each patient might always be furnished with all the clean linen he could require. The food from the extra diet kitchen was delivered on a simple order from the Medical Men. All this was effected without in any degree interfering with the pre-existing officials and their subordinates, whilst strict injunctions were given that nothing should be done for any patient without the positive instructions of the Medical

(1) Average daily issue of extra diets supplied from Miss Nightingale's kitchens to extra diets rolls of the Medical Officers, Barrack Hospital, Scutari, from 13th January to 13th February, 1855.

| No. SUPPLIED. | —              | FROM PUBLIC STORES. | FROM PRIVATE SOURCES. |
|---------------|----------------|---------------------|-----------------------|
| 25 gallons    | Beef tea       | 80lbs. beef         | .....                 |
| 15 —          | Chicken broth. | 28 chickens         | 12 chickens           |
| 40 —          | Arrowroot      | .....               | Arrowroot             |
| 15 —          | Sago           | .....               | Sago                  |
| 240 quarts    | Barley water   | Barley              | .....                 |
| 10 —          | Rice water     | Rice                | .....                 |
| 8 —           | Lemonade       | .....               | Lemons                |
| 30 —          | Milk           | .....               | Milk                  |
| 275 portions  | Rice puddings  | Rice                | .....                 |
| 15 bottles    | Port wine      | .....               | Port wine             |
| 3 —           | Marsala        | .....               | Marsala               |
| 3 —           | Brandy         | .....               | Brandy                |
| 15 hgs.       | Jelly          | .....               | Isinglass             |
| 4 dozen       | Eggs           | .....               | Eggs                  |
| 40            | Chickens       | 28 chickens         | 12 chickens           |



Men. All susceptibilities and jealousies were thus silenced, whilst the most active measures were being taken to supply the most glaring defects of the Hospital.

But everything was confusion in the Hospital. The orderlies were always running to and fro without doing anything. The distributions were most irregular, beginning sometimes as early as four o'clock, and scarcely finishing at seven, for the morning; and the dinner, which should have been served at twelve, was frequently not finished before five or six, and even then, many of the patients did not receive the diet which had been prescribed for them. Many others, particularly those who were the most dangerously ill, were altogether forgotten, or they could not eat the cold coarse food, even if they did get it.

All this disorder disappeared under Miss Nightingale's influence. Her merit was soon felt and appreciated by every one. It was impossible to be the daily witness of the immense services she rendered so quietly and so perseveringly, without paying due homage to her great superiority. All prejudices immediately vanished,—her great prudence and exquisite tact were the subject of universal admiration, and all hearts were gained by her kind attention to every one. The heads of the different departments, instead of any longer taking umbrage at her authority, were but too happy to lend themselves and all their influence to anticipate her wishes, and esteemed themselves highly honoured when they received a word of encouragement and approbation. From this moment, all difficulties were overcome; and Miss Nightingale gained an immense ascendancy, which allowed her the free exercise of her powerful mind in carrying out the most important measures for the health and comfort of the sick.

The British Ambassador at Constantinople, the



General commanding at Scutari, in fact all the authorities had received orders to enquire into and to provide for all the deficiencies of the Hospitals. But with all their zeal and efforts they could accomplish nothing. Everything bore a different aspect as soon as Miss Nightingale appeared on this scene of misery and suffering. With her skilful cooperation, the immense resources of the Government and the large sums of money which had been raised by public subscription, were advantageously employed.

A vast quantity of clothing, comestibles, wines, etc., was addressed to Miss Nightingale from England by the generous donors. All these things were of the greatest possible value, for they could not have been procured for money in that part of the world. But, in a very short time, the accumulation was so great, that Miss Nightingale, after having repeatedly thanked the donors for their patriotic gifts, was obliged to announce by the public Press that her stores were so full that she could not receive anything more (1).

(1) Abstract of some of the principal articles supplied from Miss Nightingale's stores to the Hospitals and at Scutari, on requisition from medical officers:—

|                                    |              |   |              |
|------------------------------------|--------------|---|--------------|
| Shirts (flannel and cotton) ..     | 50.000       | Air beds and pillows .....              | 232          |
| Pairs of socks and stockings ..... | 23.743       | Thread and tape (packages) ..           | 74           |
| Pairs of drawers .....             | 6.813        | Lanterns, candle lamps, and lamps ..... | 168          |
| Towels .....                       | 5.826        | Preserved meats .....                   | cases. 253   |
| Handkerchiefs .....                | 10.044       | Meat biscuit .....                      | barrels. 2   |
| Comforters .....                   | 9.638        | Isinglass and gelatine .....            | lbs. 148 1/2 |
| Flannel .....                      | yards. 1.384 | India rubber sheeting—pieces            |              |
| Pairs of slippers .....            | 3.626        | 235 yards .....                         | 26           |
| Knives and forks .....             | 856          | Camp kitchens, cooking stoves           |              |
| Spoons .....                       | 2.630        | and canteens .....                      | 55           |
| Night caps .....                   | 4.524        | Boilers and stew pans .....             | 68           |
| Gloves and mits .....              | pairs. 4.545 | Tables and forms.                       |              |
| Drinking cups .....                | 5.477        | Baths, soap.                            |              |
| Tin plates .....                   | 2.086        | Games.                                  |              |
| Basins, zinc, etc .....            | 624          | Brooms, scrubbers, bed pans, tin        |              |
| Dressing gowns .....               | 1.004        | pails, combs, scissors, etc., etc.      |              |



It must not be supposed that Miss Nightingale's influence was confined to the Barrack Hospital. Some of the ladies, who had accompanied her to Scutari, were, after a time, sent on to the Crimea, with full instructions, and the necessary means of carrying out the sanitary measures which she had so judiciously established, to the astonishment and admiration of every one.

We have already spoken of the impulse and direction given by Miss Nightingale to the attendance on the sick, and to the supplying their immediate wants. We must now more particularly mention the sanitary measures to which we have just alluded. In the interior of the Hospital, new flooring, white-washing, everything which could contribute to general cleanliness, was executed as quickly as possible. Sewers were made, and the neighbourhood of the Hospital was kept free from all nuisances. One great cause of mortality still remained—the crowding together of the patients. The number could not be limited, for all had an equal claim to admission, and therefore all had to suffer. New wards were built and added to the Hospital as quickly as possible. By this means, Typhus fever, Hospital gangrene, and Purulent infection, fatal diseases, which owe their origin to the crowding together of patients and to the other defective hygienic measures, were suddenly extinguished.

Since the Crimean War, we have had the Italian War, during which we find no trace whatever of these terrible diseases in the French army; and this is entirely due to the care of the (1) “‘Intendant Général,’ under the instruction of the Baron Larrey, Physician in Chief of the army. Instead of crowding the patients together in a

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(1) *Gazette Médicale de Paris*, 1862.



large Hospital, as had hitherto been the fatal habit in the French army, the sick and wounded were dispersed in a great number of small Hospitals. There were as many as thirty-eight Hospitals in the town of Brescia."

(1) "The Physician in Chief of an army should meet with no obstacle to the prompt execution of his duty; the administrative authority of the 'Intendance' should aid and assist him with all the means of which it disposes." The truth and importance of this observation are sufficiently demonstrated by the absence of all Hospital diseases in the French army during the Italian campaign; and "this, we believe, is the first time that the Physician in Chief was ever invested with so much power and authority by the Commander in Chief of an army, so that all the resources of science could be called into action in this memorable campaign."

In resuming our relation of the Crimean War, we must draw attention to the following important observation — a vast number of men were sacrificed by the allied armies. The French lost seventy-five thousand from their total number, three hundred and nine thousand five hundred and seventy; and the English, twenty-two thousand, from a total of seventy thousand!! We are enabled to affirm that this enormous sacrifice in both armies was occasioned by Hospital diseases, Typhus fever, Hospital gangrene, and Purulent infection, all of which could have been prevented, as was the case in the Italian campaign. We must confine ourselves to the relation of the campaign of the British army, and let us ask what would have become of this army, if the sanitary measures we have spoken of had not been taken, and if death had been allowed to continue its ravages in the same degree during the whole of the

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(1) *Gazette Médicale de Paris*, 1862.



Crimean War? Let us hope that this cruel experiment may never be repeated, but it must not be forgotten that the sacrifice of such noble soldiers is a severe lesson, which should be ever present with us. What could be more painful than to see such fine gallant soldiers fearfully swept away, not on the field of battle, nor by the ordinary chances of war, but in their camps and their Hospitals, from the absolute want of foresight and care? Horrors stared one in the face in every quarter. One shudders at the thought of such crowding together of sick and wounded, that, by their being packed together in so small a space, they brought death on themselves and all who approached them, so that no one could come to their assistance without being exposed to the fatal influence. An Hospital in such a condition is like an open crater, which, to a certainty, will engulf all who approach too near. Such was the gulf into which Miss Nightingale and her heroic little band dared to venture, and by their heroism not only did they rescue many from certain death, but they succeeded in closing the horrid gulf for ever.

We are naturally engrossed by the causes which produce such frightful mortality in time of war, but a feeling of humanity obliges us to assert, that in time of peace the same causes are allowed to exist, with of course the same fatal consequences. We have endeavoured to point out the causes, to which at least half of the mortality in camps and in Military Hospitals must be attributed, we must also assign three-fourths of the mortality in the Civil Hospitals to the same causes. (1) "There are many wards in the great Hospitals, where the sun has never penetrated, where the air has never been completely renewed, and where all kinds of filthy

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(1) *Gazette Médicale de Paris*, 1862.



emanations accumulate. Are these the conditions proper for the re-establishment of health amongst the poor and miserable, whose illness can often be traced to filthy habits, and to the bad hygiene by which they live surrounded?"

We are naturally distressed and afflicted, on contemplating the disasters which overwhelm an army in a campaign, but however terrible these disasters may be, the affliction is only partial and temporary, whilst in the Civil Hospitals it is general and permanent.

(1) "Can any one calculate the thousands of victims that have been and still continue to be sacrificed, notwithstanding all the care and the efforts of the best Physicians and most skilful Surgeons, in that horrid den of death 'l'Hôtel-Dieu de Paris?' It has long been acknowledged that this Hospital is in the worst possible state of hygienic conditions, and it has long since been condemned to disappear, but it still continues to exist."

It is useless to enter into any details respecting the Civil Hospitals, since the most able and zealous Physicians have for some time past made this their most serious study. The sanitary condition of the Hospitals is indeed become one of the most important and prominent questions of our day. The "Académie Impériale de Médecine" concentrates all its attention on this subject. After long and most interesting discussions during a great number of sittings, the "Académie" has deputed a Commission, composed of its most eminent members, to complete the study of this question, and to carry out, we doubt not, one of the greatest and most useful reforms of our time.

But it is not an easy thing to bring about these reforms.

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(1) *Gazette Médicale de Paris*, 1862.



We have only to look back to the history of "l'Hôtel-Dieu de Paris," which the good King Louis XVI visited. And on finding four persons, afflicted with different diseases, lying in the same bed, this benevolent and martyr king, horrified at such a spectacle of human misery, issued a decree for its immediate reform. But all the influence and power even of a sovereign could not avail against the stubbornness of stolid routine. This state of things was still to continue for a long time, requiring nothing less than the violent hand of a furious Revolution finally to overcome it. From this one example we may judge of the difficulties which reforms are destined to meet at all times, now as in time past!!

Is it not an inevitable consequence, that, as the Hospitals are specially destined for the reception and treatment of sick people, they should be under the direction and responsibility of the medical men? Such is the natural conviction of public opinion. But is not this direction practically a fiction and this responsibility an injustice? Can nothing be done to remedy this state of things? Should not the medical men of the Hospitals possess all *power* and *possible authority* to carry out the measures which their patients may require? It is a deplorable evil that, by the rules and regulations of the Hospitals, the medical men should be deprived of this authority, or that their power should be in any degree weakened by the control of a non-scientific power. Medical men should have an hierarchy of their own in every Hospital, to which alone they should be subject.

This digression is quite accessory to our subject, as it leads us to another feature of Miss Nightingale's powerful mind. All the reforms we mention are either directly or indirectly claimed by her, in her remarkable work, "Notes on Hospitals." This is a most practical, scientific, work on the construction, management, and admi-



nistration of Hospitals—indispensable to all persons who require information on this subject. Another book, "Notes on Nursing," is one of the most useful books that could have been published. It was absolutely required, for no one can tell how much patients suffer, and how often lives are sacrificed, even amongst the most wealthy classes of society, from the want of that special knowledge of nursing which can be acquired only by the most thoughtful application and training. *The Lancet* (Medical Journal) announced this little book as a remarkable publication, an interesting study for Physicians and Surgeons, a homily for women, and a guide for nurses. *The Medical Times* said, "No one but Miss Nightingale could have written such a book as the one we have before us on nursing."

But to return to the Barrack Hospital where Miss Nightingale was apparently overwhelmed by the additional cares, correspondence, etc., necessary for carrying out the sanitary reforms which she had initiated, and where all depended on her own active mind and energy, having to struggle against a host of powerful antagonists, we shall find that all this did not prevent her from taking her share in the fatiguing and painful duties of nurse-tending on the sick and wounded. On her first entering on these functions, the state of the Hospital was frightful. The medical men, the sisters, the nurses, all were swept away around her. Nothing appalled, she gathered more strength and energy in the midst of distress and woe. Miss Nightingale was seen everywhere and at all hours. She was frequently observed silently making her way at night through long ranges of the sick, with a little lamp in her hand, to see to the wants and comforts of those who were most dangerously ill. Often, alas! she was alone at this solemn hour, receiving the last thoughts for absent parents and friends, and offering



the last consolations to the dying soldier, thus uniting in her person all that is held most sacred : Family, Country, and Religion.

We must here pay due homage to all who devoted themselves so nobly, with Miss Nightingale, to these most trying and painful duties. The Sisters of St. John, those of Miséricorde and of Miss Sellon, must be particularly mentioned ; for these holy women, accustomed to discipline, and well trained in their duties, rendered incalculable services ; they were indefatigable, and their courage knew no bounds, for in their devotion and self sacrifice, they looked forward with joy to the glorious recompense of eternal bliss.

In following things in their natural order, we have been obliged to pass from camp life, to enter more particularly on the soldier's condition in the Hospitals. We must now return to our first researches, enquiring into the origin and causes of so much distress and suffering of the British army in camp. Without recapitulating the disastrous consequences, occasioned by the defective organisation of the Military Administration, at Malta, Gallipoli, Varna, and Eupatoria, we are obliged to refer to them again, since all the misfortunes which overtook the army owed their origin to the same want of provision and absence of administrative power, till almost the end of the war.

We have first to speak of the nature of the soil on which the army was encamped before Sebastopol. The ground was rock with clay, covered by a very thin layer of vegetable mould. The water, after the rains, could not penetrate the soil, but remained everywhere stagnant, converting the whole camp into a vast marsh. The roads became impassable, and the trenches were filled with thick muddy water. Secondly, the soldiers were not protected from the rain which filtered through



their ill-conditioned tents, so that the twelve or fourteen men, who huddled together to keep themselves warm, were always wet to the skin, and their clothes saturated with liquid mud. Such was the position of our poor soldiers, who had passed from twelve to twenty-four hours, and sometimes even more, in the trenches, undergoing enormous fatigue, and exposed to great danger. This was not all, for often after returning from their duty in the trenches, they were obliged to wade through clayey mud for a distance of five miles to get their provisions, which were frequently greatly deteriorated, and sometimes deficient in quantity. Nothing can raise the character of the British soldier higher, than the patience with which he bore all these hardships and privations. On no one occasion was there the least sign of insubordination, which so often arises from such disastrous circumstances, and is the utter destruction of armies.

The army had to suffer from the difficulties of procuring its provisions, in addition to all the hardships of its encampment; but the administration, far from being in fault, had proposed the establishment of dépôts of provisions. This was not done, for the simple reason that the beasts of burden of the administration were most imprudently taken by the military authority for the transport of ammunition, and thus, when the bad weather set in, the victualling became almost impossible. Such a misfortune as this could not have happened, if the British army had had an authority like that of the "Intendant Général" in the French army, in whose hands are concentrated all the different branches of the Military Administration, completely separate from, and independent of the service of ammunition.

We already know what were the deplorable consequences of such a state of things. The simple announ-



cement of the number of the sick will be a sufficient comment on the disorder which reigned in the army. There were three thousand five hundred men on the sick list in the camp before Sebastopol, and from seven to eight thousand in the Hospitals of the Bosphorus, out of the effective force of twenty thousand men. Of the remaining nine thousand, not one could be considered efficient. Such were the disastrous consequences of a defective administration! But how came it that the administration was so defective? The immediate consequences of such a state of things must have been evident to the most simple-minded person, and the advantages of a well organized administration were sufficiently demonstrated in the French army, to any one who would take the trouble to study it. The whole blame, as we have already seen, must be laid on the short-sighted calculations of our economists. How grievously they must have reproached themselves, when the state of the army could no longer be disguised, and they saw so many noble soldiers perishing from cold, hunger, and diseases,—the consequences of their rigid economy depriving them of the assistance of the most essential part of the military service—a good administration. Should not the lives of men, who sacrifice themselves for their country, be cared for? Should not the soldier be assured not only of the sympathy, but of the assistance, which all the resources of his country can procure? Can there be a more heart-rending spectacle, than to see these noble soldiers, after having gained a great victory and saved the honour of their country, lying, the dying and the wounded, in the most hideous confusion, abandoned amongst the dead on the field of battle? And this, from the want of the necessary means of immediately carrying off our wounded from this scene of carnage!

What would have become of our soldiers in such a



distressing state, had it not been for the administration of the French army, which so generously came to our assistance? Our men were making every effort to carry off their comrades from the field on stretchers, when the French "Train des Équipages" happily came to assist them in their interminable labour.

We are glad to take this opportunity of saying, that England can never acknowledge with too much gratitude the services which the Military Administration of the French army rendered our soldiers during the Crimean War. Monsieur l'Intendant Général Blanchot was unceasing in his kind assistance, often even anticipating the wants of the army. We cannot also forget the earnest endeavours of Messieurs les Sous-Intendants Pironneau and Le Creurer, who were anxious and zealous on all occasions to assist the army; but we must particularly mention Monsieur Le Creurer, to whom we owe the prompt arrival of five hundred mules, with their "Litières" and "Cacolets," to carry off the wounded after the battle of Inkerman. Many a British soldier owes his life to this timely and active assistance.

If it should be supposed that we have given an exaggerated accounts of the state of the army in camp and in the Hospitals, we would refer to the official documents which employ more powerful language than we do; but, as our principal object is to show the enormous difference there is between the services of a bad and a good administration, it was necessary to confine ourselves to as plain a statement as possible of the exhaustion and almost annihilation of the army, so that we may the more effectually contrast its admirable condition at the end of the war, when the provisions were regularly supplied, and the necessary hygienic measures fully carried out.

We are enabled to establish this contrast in the most



striking manner, by the quotation of the comprehensive and satisfactory answer given by Miss Nightingale, to this question from the Commission appointed to enquire into the Regulations of the sanitary condition of the army :—

“We have more information on the sanitary history of the Crimean campaign than we have of any other. It is a complete example—history does not afford its equal—of an army after a great disaster arising from neglects, having been brought into the highest state of health and efficiency. It is the whole experiment on a colossal scale. In all other examples, the last step has been wanting to complete the solution of the problem.

“We had, in the first seven months of the Crimean campaign, a mortality among the troops at the rate of 60 per cent. per annum from disease alone—a rate of mortality which exceeds that of the great plague in the population of London, and a higher ratio than the mortality in Cholera to the attacks; that is to say, that there died out of the army in the Crimea an annual rate greater than ordinarily die in time of pestilence out of the sick.

“We had, during the last six months of the war, a mortality among our sick not much more than among our HEALTHY Guards at home, and a mortality among our troops in the last five months, two-thirds only of what it is among our troops at home.

“The mortality among troops of the line at home, when corrected as it ought to be, according to the proportion of different ages in the service, has been, on an average of ten years 48.7 per 1,000 per annum; and among the Guards 20.4 per 1,000 per annum. Comparing this with the Crimean mortality for the last six months of our occupation, we find that the deaths to admissions were 24 per 1,000 per annum; and during



five months, viz., January to May, 1856, the mortality among the troops in the Crimea did not exceed 14.5 per annum.

“Is not this the most complete experiment in army hygiene?”

“We cannot try this experiment over again, for the benefit of inquirers at home, like a chemical experiment. It must be brought forward as an historical example.”

Thus Miss Nightingale shows that the army, which had been nearly annihilated by sickness and death, passed almost suddenly to a most healthy and admirable condition, under the influence of proper hygienic measures and an efficient administration, though the circumstances of climate, season, and war remained unchanged.

This rapid decrease of mortality from 60 per cent. per annum, during the first six months, to 14.5 per cent. (“14.5 per 1,000”) during the last five months, was a marvellous result!! Though the whole merit of this wonderful improvement cannot be attributed to Miss Nightingale alone, at all events the surprising success obtained in the Hospitals is entirely due to her powerful mind and direction, whilst the immense improvement in the camp must be attributed to the Sanitary Commission called for by Lord Raglan.

The powerful influence of Miss Nightingale was at first concentrated on the Barrack Hospital, but she was soon called on to give the same impulse and direction to the Hospitals in the Crimea. Typhus fever and Cholera were making the greatest ravages in the army when Miss Nightingale undertook her first voyage to Balaclava. The state of the army at this time was fearful. She hastened the construction of a great number of huts for the reception of the sick, and, assisted by Monsieur



Soyer, she had new kitchens established, and gave a new impulse to all the Hospital services in the Crimea.

It is curious to observe how rapidly Miss Nightingale overcame all the difficulties and embarrassments she had to encounter on her first arrival at Scutari. Her independent authority was preserved from the beginning by the careful avoidance of all discussions, and by the prompt measures which she took to supply all deficiencies without clashing with any other authority. Now that her influence was acknowledged by every one, we find her surrounded by all the homage due to her transcendent merit. She could go nowhere without receiving every mark of gratitude and respect, though she so studiously avoided every occasion for public demonstration. The military authorities, the medical men, the Commissariat officers, etc., hastened always to meet her, and were extremely flattered by her acceptance of their services in any of their special departments, so that her power was greatly increased and extended in every direction. Measures were soon taken to provide for the treatment of patients on the spot. Thus the painful journey to Balacava and the often fatal voyage to Scutari were suppressed, and the agglomeration of sick, of which we have seen the frightful consequences, ceased.

The necessities of the service obliged Miss Nightingale three times to undertake the voyage to Balacava. These voyages on the treacherous Black Sea, added to the overpowering fatigue and the deleterious atmosphere to which she so daringly exposed herself, at length exhausted her vital energies, and she lay prostrate, dangerously ill, in the Crimea, from whence she was obliged to allow herself to be carried back to Scutari. Even in this strait, when her physical powers were exhausted, her mental energy was still devoted to the



sanitary state of the army, and her powerful influence was maintained without interruption.

During one of her visits in the Crimea, Monsieur Baudens, who was then inspecting the medical service of the French army, had the good fortune to meet Miss Nightingale. In his "Mission en Orient," he says, "This delicate young lady, who was seen riding through the ambulances, visited the sick of the three allied armies with the same anxious care. When Typhus fever reigned in our camps, she made a present to the French and Sardinian ambulances of a very considerable quantity of Port wine, and preserves of all kinds."

As we have made mention of Monsieur Baudens' name, we will quote some of his observations on the British army in the Crimea, as they will assist us greatly in pointing out the ameliorations which brought about the marvellous change we have already mentioned. "The habits of cleanliness," he says, "are remarkable in the British army; the soldiers wash their linen in warm water, so as to have a change of linen twice a week."..... "The English camps were provided with every kind of comfort, so that the soldiers were preserved, in 1856, from Typhus fever and Scorbutic affections which ravaged the camps of the allies."..... "The British army passed the whole winter of 1856 in well-closed huts. Every morning, the floorings on which the soldiers had lain during the night, were raised, and, after being replaced, were covered with fine sand which was swept away again at night. *A stove well filled with coal was kept constantly burning, so that the ventilation from the roof could always be kept open.* Two huts served as reading rooms, in which were to be found, besides books, benches, tables, pens, ink, and paper."

We must here remark that a great part of the conveniencies of these huts was furnished from Miss Night-



ingale's private purse. This was but a very small part of her generosity, which was extended also to the Hospitals where she caused amusing lectures to be given, and the attraction to be increased by magic lanterns, etc.

We continue our quotation. "The English," says Monsieur Baudens, "had very large tents for their Regimental Infirmarys during the summer. Each tent contained twenty-four iron bedsteads, with their night tables. The flooring was moveable and extremely clean. Each patient had a bedside carpet, and a Hospital uniform. The English ambulances were kept extremely clean. Such was not the case with our own."..... "This difference depends in great measure on the more important and independent position of the English medical man who exercises a greater authority in the execution of hygienic measures. The alimentary regimen differed also from that of the French ambulances. Tea, roast meat, and puddings were the principal food. The medical men could prescribe beer, wines of all kinds, rum, brandy, and anything they might think proper, with the precaution of ordering the extras the day before. In the ambulance stores, I saw even Champagne, which was useful in certain cases of vomiting."

From this description it might appear, that we were too lavish in procuring so much comfort for our soldiers in campaign. This would indeed be a great error. It is precisely when our soldiers are exposed to so many privations and sufferings, that they should be attended with every care, and that nothing should be spared to render their position as comfortable as possible under all circumstances. We cannot have a better example of the immense results to be obtained from such solicitude and care, than that which we have just produced of the British army. Not only did Typhus fever disappear from the English camp, but the soldiers remained per-



fectly secure from its infection, whilst the disease continued its ravages, by their side, in the French and Sardinian camps, but all the other diseases, which had till then caused so much mortality, disappeared also. This immunity from disease and economy of life obtained in the British army becomes almost incalculable in its results, when we look back on the enormous sacrifice of life which till then had taken place in the army. Miss Nightingale clearly demonstrates this, in one of her answers to the Commission before mentioned. "*During the ten weeks intervening between May 5th and July 14th, 1855, ninety-six per cent. of all the deaths from disease were of the classes usually considered mitigable and zymotic.* That is to say, that, granting that the four per cent. were not preventable, there might have been saved to the Commander of the Forces a large part of the ninety-six out of every hundred men he lost from disease.

The strength of the army and the success of war require that everything should be ready to preserve the health and contribute to the comforts of the soldier. Too much cannot be done to attain this object, for the greater the sum well spent, the greater the economy in a question of life or death, victory or defeat. When an army goes forth to war, the country should be assured that everything is provided for its success. Troops, that are not *always* prepared for war, are nothing better than an isolated band of soldiers. It is the Military Administration that make them an effective army, this Military Administration should always then, be prepared for war. Are not soldiers formed by discipline and exercise in time of peace? Should not the Military Administration be studied and perfected in all its branches in time of peace also? Our disasters in the Crimea should at least serve us as a proof that an army without



an effective administration is doomed to destruction. But through the medium of a good administration, all the resources of the country would be available, and when our noble soldiers go forth to war we might confidently look forward to their success and glory.

We may perhaps be expected to specify the causes, to which we attribute the happy change which took place in the sanitary state of the British army. First, then, the victualling became more easy, and the supplies more abundant; for this we have only to refer to what has already been said. Secondly, better arrangements were made with regard to hygienic measures. Here some further explanations may be necessary.

Two questions naturally arise from this subject,—the first is, how better arrangements could exercise so great an influence on the sanitary state of the British army. This is easily explained. By draining the camp and carefully carrying off everything from which unwholesome emanations could arise, by providing a more healthy and convenient lodging for the soldier, by preventing the crowding together of the sick, and by the establishment of a good system of ventilation, all causes of evil were removed.

Enough has been said on the quartering of soldiers, and of the crowding together of sick in Hospital, but with regard to ventilation some further observations are required; for we have learnt, from long experience, that the necessity of ventilation either meets with an obstinate resistance, or when the necessity is admitted, artificial and illusory means are often employed to procure it.

Ventilation is the means we employ to obtain the renewal of air in our dwellings. This renewal of air is necessary for our respiration. As respiration is one of the principal functions of life, we might say *the* principal, so ventilation is the first condition of health. All



the functions of organic life receive their impulse from the quality of the air we breathe; whence arises the necessity of continually renewed pure fresh air for the support of life. If the air we breathe be more or less unfit for the support of life, all the functions of the human frame must be more or less impaired. In all cases of illness, then, pure fresh air must be procured, to re-animate organic life, before any kind of medication can be attempted.

We may be told that there is nothing particularly new in the discovery that we live by the air we breathe. This is true, but it is true also, that though pure fresh air is admitted by every one to be the *pabulum vitæ*, vast numbers of sick, in every class of society, suffer greatly, and very frequently die, from the stupid precautions which are taken to deprive them of the breath of life.

We will now pass on to the second question. By what means were better and more comfortable quarters obtained, putting an end to the crowding together of the men, and procuring good ventilation? By the construction of huts on good hygienic principles, and in a sufficient number. Monsieur Baudens, in general terms, speaks very highly of these huts, and on examining them more attentively, we shall find that the plan of their construction provided at once for all deficiencies.

The English huts were all formed of wood, after the same plan, the interior being made comfortable for the men, and more particularly so for the sick. They were placed on elevated spots, and isolated from each other, so that the external air circulated freely round them, and they were all provided with moveable boarded floors. Such conditions require no comments. The huts were spacious for the number of men, and even more room was given to the sick. Three hundred and



thirty cubic feet were allowed for each soldier, and five hundred for every patient (1).

Thus the most efficacious measures were taken to prevent any overcrowding, and ventilation was well established. There were six large openings, and sometimes even more, in the roof of each hut. These ventilators were always left open, so that the more the air was heated in the interior, the more it was rapidly renewed by the attraction of pure fresh air from without. There were always three windows, and often more, on each side, according to the length of the hut. There were also two doors, one at each end, and a small window on pivots over each door. The windows and doors were opened every day, so as thoroughly to renew the atmosphere of the whole building. With these explanations, the causes to which the wonderful improvement in the sanitary state of the British army are to be attributed, become sufficiently evident. But this improvement becomes even more remarkable, when we reflect that the British army, which had suffered so much until then, enjoyed an absolute immunity from Typhus and its contagion or infection, at the very time that this terrible disease continued its fearful ravages in the French and Sardinian camps. It is impossible to account for this marvellous improvement by any other means, than the great change and amelioration which had been made in the soldiers' quarters. For whilst the two allied armies remained in the same condition that they were, nothing bettered by the huts they had constructed, the most perfect ventilation was established in the English huts, and the most important hygienic measures were carried out with the greatest energy and promptitude.

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(1) Dr. Bryce, *England and France before Sebastopol*. (Cubic space is an illusion unless accompanied with free ventilation.)



Almost all the French and Sardinian huts were built with mud plastered on branches of trees entwined on stakes driven into the ground. There was no flooring but the bare ground, which was always saturated with animal matter and filth of every kind. These were very bad conditions for the soldiers' repose and shelter; for the sick it was much worse. It was impossible to make these huts clean and fresh. They were built by choice on low ground; pits were often dug to receive them. All these precautions were taken from the unreasonable and mistaken fear of the effects of pure fresh air. Could anything be more uncomfortable and more unhealthy?

The overcrowding existed in all the huts; and in the ambulances the men were packed together without any consideration for air and space. As the number of the sick in the French and Sardinian camps increased, they were necessarily more and more crowded together in these miserable ambulances. The number of sick in the French army during the last six months of the occupation rose to 73,422. Is not the agglomeration of this enormous number of sick in the few huts employed as ambulances a frightful example of overcrowding? As for ventilation, there was none; and with regard to ventilators in the roof, there was no idea of anything of the kind. There were three windows on one side of each hut, with a door, and a small window above it, at one end of the building. These doors and windows were always kept closed, and even if they were opened, the vitiated atmosphere could not be completely cleared out from the interior. As there was no means of introducing pure fresh air, it was impossible to renew the atmosphere of these huts, which consequently became more and more saturated with deadly miasmata. Such was the pernicious state of the atmosphere in all the huts; but in the ambulances, where men suffering from Typhus



fever, Dysentery, etc., etc., were crowded together, they were a constant source of infection to each other. Their breath, the emanations from their bodies, their bedding, the ground, and the walls of their huts, were all saturated with putrid animal matter. Could these ambulances be anything but the foci of the most virulent infection?

We can give only a faint idea of this horrid state of things. More than half (73,422) of the French army (142,391 men) were in Hospital; and of the remainder scarcely a man was capable of bearing arms. During the month of February alone 20,800 sick were received in the ambulances, and *almost all of them died*. The exact number of deaths was probably not known, at all events it was never published, that we know of.

How was it that the British army attached so much importance to ventilation, and escaped this plague in so marvellous a manner, whilst the French and Sardinians were nearly exterminated? The study of the habits and customs of different people will account for this, for all people carry their habits and customs with them wherever they go.

In England, the predominant principle in the construction of all Hospitals is ventilation — the free circulation of pure fresh air in the interior of the buildings. The wards in the London Hospitals have several direct communications with the external atmosphere, in addition to the open chimneys and windows. In St. George's Hospital, there is a large opening through the roof above each staircase, so that the atmosphere of the staircases and passages is continually renewed, and none but pure fresh air can penetrate the wards even from the interior of the building. With such practical ideas on ventilation, it was quite natural that the British army should carry



out the same principle in the construction of their huts.

In France and in Italy, on the contrary, there is a perfect horror of fresh air. It seems ridiculous to say, that even in these countries, no one can deny that air is necessary for the support of life. Is it not then inconsistent, that, in these countries, every precaution should be taken to prevent pure fresh air from penetrating into their Hospitals, even when these establishments are built on the best plans, and with the special object of ventilation? This absolute horror of pure fresh air, which exists at all times, and in every class of society, is quite sufficient to account for the absence of all care for ventilation in the construction of the French and Sardinian huts.

The question of ventilation has been practically solved in the Crimea, and on so large a scale that we trust the disastrous experiment may never be repeated. May we, however, hope that this lesson, in which the lives of thousands, and often the honour of nations, are at stake, may not be forgotten? If ventilation has proved itself of such vital importance in the temporary huts of the Crimea, is it not of still greater importance in the permanent Hospitals? We have seen that nothing can be more conducive to the restoration of health than the free circulation of pure fresh air in the interior of Hospitals. Yet we find that this essential condition is not attended to in the Hospitals of Paris, and the attention of the Académie Impériale de Médecine has been roused to enquire into the mortality that undoubtedly arises from this cause. Here again, as on all occasions, we find the voice of Miss Nightingale raised in the cause of humanity. On the 22d of April, 1862, we had the honour of addressing the following letter to the Académie, on the sanitary state of the "Hôpital de Lariboisière," communicating Miss Nightingale's opinion on the subject.



“ On examining the magnificent plans and excellent arrangements of this fine building, guaranteed by the greatest authorities (Gueneau de Mussy, Messieurs Louis, Rayer, J. Cloquet), we find that the principle by which these gentlemen were guided was that of ventilation in as simple and as perfect a manner as possible. This *natural* ventilation is now replaced by very ingenious and expensive systems of *artificial* ventilation.

“ I have just received a letter, dated London, April 12th, from Miss Nightingale, a very great authority for me. Miss Nightingale says, ‘With regard to the very high mortality of the Lariboisière, it is perfectly well known here. Four years ago, the *compte-rendu* showed it to be one of the most unhealthy of Hospitals. The causes were fully discussed then and by persons intimately acquainted with it. The result was, that the unexpected mortality was due neither to site nor to construction, nor to overcrowding, but to very bad ventilation.

“ ‘Hot air is altogether objectionable for human beings. It keeps the body in a continually relaxed state. The tonic of fresh air is denied to the sick, who are, as it were, in a constant state of being cooked in a cool oven.’ (1)

“ Why not have courage, and introduce open fire-places, and air the wards from without at the natural temperature?

“ Try it on one pavilion. The want of ventilation in the Lariboisière is the worst I ever met with.

“ Ventilation *with* warm air is one great mistake.

“ Radiated heat, and regulated admission of fresh air, with shafts for removing foul air, would cure the Lariboisière. Nothing else will.

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(1) The latter part of this letter was not transmitted to the Académie.



“The expression ‘le Versailles de la Misère,’ is terribly true. Let it not become proverbial.

“While we are striving to introduce into and force upon England the pavilion construction for Hospitals, which is derived from France, the French are forcing it into contempt by their abominable *artificial* ventilation, and thus actually thwarting a progress which we acknowledge to be started by them.”

Our subject has led us to compare the French with the English huts in the Crimea. It is very curious, but we shall be able to establish the comparison between the huts built by the French themselves in Algiers, and in the Crimea, with the same advantage. We allude to the huts called “les Baraques de l'Hôpital du Dey.” These huts were quickly run up in the beautiful garden of the Dey, soon after the occupation of Algiers. This garden is admirably situated on a little elevation at the foot of high mountains, on the border of the Mediterranean. The huts were formed of planks, raised on masonry, above the ground, with wood floors, and several windows on each side.

Though considered quite as temporary constructions, they lasted upwards of twenty years, and we believe that some of them still exist. They were threatened with demolition on several occasions, but were always allowed to remain, *because it was pleaded that the patients recovered more quickly, and that the mortality was less in these huts than in the regular Hospitals.*

We account for this great advantage by the air which penetrated freely into every part of the building, through the chinks which existed between the boards, thus *accidentally* obtaining the same salutary effects as from the ventilators in the roofs of the English huts in the Crimea.

Why did not the French obtain the same advantages



from their huts in the Crimea, that they had for so many years experienced in Africa? They *could* not, because the reason why the "Baraques de l'Hôpital du Dey" were so superior to others had passed unperceived; and the horror of pure fresh air prevented them from appreciating the principle of ventilation. The plan and mode of constructing the huts in the Crimea were consequently opposed to the theory of ventilation.

We must confess that we ourselves have derived immense assistance from ventilation, under circumstances which we were far from appreciating at the time. This occurred in January, 1846, at Sétif, Algeria (1). There were 2,332 men sick from the effects of cold; 4,800 of these were cases of partial asphyxia, with slight local affections. They were treated in the barracks, and recovered in a short time. Of the remaining 532, all of them cases of the most serious nature, which were admitted to the Hospital, 477 required medical treatment, 49 died; 55 were surgical cases, 46 of which were amputations, 3 died. This was considered an immense success; but to be enabled to appreciate it, we must take into consideration the difficulties which asphyxia from cold with local mortification opposes to the vital power necessary to general reaction, and to the cicatrization of wounds of this nature, particularly in cases of amputation. This accounts for the frequent failure of all our efforts under similar circumstances. And here we must take into consideration the fatal consequences of the crowding together of so many patients, with the foetid emanations from their mortified wounds.

We have only to refer to the war in the Crimea for a

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(1) Reference may be made to our "Relation Médico-Chirurgicale de l'Expédition du Bou-Thaleb." (*Mémoires de Médecine, de Chirurgie et de Pharmacie militaires*, vol. XVII.)



terrible example of this nature. Monsieur Scrive says that with the thermometre at 5° below zero, on January 4th, 1855, there were 2,500 men in the French ambulances, and that 800 of these died. He moreover says that all the patients sank and died after amputation, so that he was obliged formally to forbid every kind of operation.

To what, then, can we attribute our great success in the treatment of the 532 cases, which were certainly in themselves of a much more alarming character than those in the Crimea? *To ventilation.* If our patients had not been accidentally placed in the most favourable condition in this respect, all the efforts of medical science would have been of no avail. The overcrowding was frightful. Straw mattresses were put close to each other, and scarcely any room was left to get near the patients. All the patients had foetid suppurating wounds, and, huddled together as they were, Hospital gangrene, and Typhus were imminent.

Under the influence of so unfavourable a combination of circumstances, it is not possible to attribute the success of the treatment to any other cause than the salutary effects of ventilation. *Ventilation is the only preventive of Hospital diseases.*

The Military Hospital at Sétif is admirably constructed, but it was full, and our patients had to be accommodated with a building which appeared, at first sight, the most unfit for Hospital purposes. It was nothing more than the shell of a building, roofed in, and with boards put together in the most imperfect manner for the flooring and stairs. There were no ceilings, so that the air circulated freely through the tiles and the whole building. The atmosphere of the wards was in this way continually changed, and as the temperature was always below freezing point, large cast-iron stoves were kept



burning, and thus the circulation of the air was greatly accelerated. Though ventilation is the principle without which no good can be effected, everything else must be done to render the sanitary condition as favourable as possible. The first thing to be done was to separate the worst cases from the others, and to give them more space; all the wards were cleaned every day with the greatest care, and the doors and windows left wide open, whilst all the patients that could be moved were taken out. We are convinced, and we trust our conviction will be accepted by every one, that the immense success in the treatment of our 532 cases of asphyxia from cold was entirely due to the active circulation of fresh air from without. Had it not been for this accidental circumstance, we should not have been more successful in Algeria, than our confrères were in the Crimea, for our patients were in a much worse condition than theirs.

We have been induced to give the foregoing examples of the immense advantages to be derived from ventilation, for, as we have already seen, we must attribute the immense improvement in the sanitary state of the British army in the Crimea to this cause. We have felt it our duty to give all possible development to a subject of such extreme importance, and before concluding this little pamphlet we must profit by the opportunity, to make a few remarks on the general application of ventilation, more particularly to Paris.

This beautiful city, which every one admires with ecstasy, increases in grandeur and magnificence every day, whilst at the same time everything is done to improve its sanitary condition. Yet this magnificent city is frequently stigmatized with the reputation of being unfavourable to ladies in their confinements, and to patients who have undergone serious surgical operations.



Paris has acquired this unfortunate reputation from the horror of fresh air with which almost all the inhabitants seem to be possessed. Every possible means is employed to prevent fresh air from penetrating the sick chamber. To this, and to this alone, we must attribute by far the greater part of the mortality from Typhus and Puerperal fevers in the city of Paris. These terrible diseases, which excite such just alarms, are not only modified in their natures, but they are disarmed of their most fearful power, that of contagion, by good ventilation. Yet we find these dreadful diseases frequently revived in the Hospitals and public establishments from the absolute want of ventilation. No other cause need be sought for the Typhus fever which raged so violently in the Colleges of Lille, Maubeuge, Stenay, Gray, St. Etienne, Tulle, and lately also in the Military College of St. Cyr. Assuredly we do not mean to say, that the state of the external atmosphere is not a matter of the highest importance; but it is well known that the absence of every kind of ventilation in the "Salles d'étude," or Class rooms, and in the "Dortoirs," or Bed rooms, was the direct cause of Typhus fever in the Military College. We must add that no benefit whatever can possibly be expected from the immense works which have been undertaken for the drainage of the country around the College, unless a good system of ventilation is established within. What good can all this drainage do, if the young men continue to breathe a corrupted atmosphere in the interior? We may ask the same question concerning the city of Paris. Of what use are all these magnificent sewers, these large boulevards, these beautiful gardens, fountains, etc., etc., if people will obstinately breathe nothing but a corrupted atmosphere in their apartments, and never allow any pure fresh air to enter the sick chamber? It is as ridi-



culous to pronounce Paris an unhealthy city, because people will expose themselves to such dangerous illnesses from their own fault, as to say that the magnificent mountains of Switzerland are unhealthy, because some poor stupid mountaineers might have suffocated themselves in hermetically closed chalets.

In concluding our little pamphlet, we must express a hope that the efforts we have made to bring forward questions of the highest interest and importance may attract the attention of eminent persons, and thus hasten the progress of reforms of the most urgent character.

Miss Nightingale has necessarily occupied the most prominent position in our account of the Crimean War; we must therefore say a few words on the termination of her glorious mission. Without doubt our heroine must have enjoyed the grateful satisfaction of seeing all her efforts crowned with the most perfect success. But if her constant humility, in the midst of all her glorious deeds, made her consider herself only a submissive instrument in the hands of God, and unwilling to admit of any personal merit, she was soon rewarded by the fervent gratitude of the whole army and nation.

Towards the end of the war the British nation wished to offer a spontaneous testimony of their gratitude and admiration to her, who had accomplished all that could be done by the exercise of powerful genius supported by true Christian heroism.

From the *Times* of December 24th, 1855, we extract the following: "At a meeting held at Willis's Rooms, on Thursday, November 29th, His Royal Highness the Duke of Cambridge, K.G., in the chair, the following resolutions were unanimously agreed to:



“4. Moved by the Marquis of Lansdowne, seconded by Sir William Heathcote, M.P. : ‘That the noble exertions of Miss Nightingale and her associates in the Hospitals in the East, and the invaluable services rendered by them to the sick and wounded of the British forces, demand the grateful recognition of the British people.’”

“2. ‘That it is desirable to perpetuate the memory of Miss Nightingale’s signal devotion, and to record the gratitude of the nation, by a testimonial of a substantial character ; and that as she has expressed her unwillingness to accept any tribute designed for her personal advantage, funds be raised to enable her to establish an Institution for the training, sustenance, and protection of nurses and Hospital attendants.’”

“3. ‘That to accomplish this object on a scale worthy of the nation, and honourable to Miss Nightingale, all classes be invited to contribute.’”

The army was foremost in the subscription for this noble testimonial, and £30,000 were almost immediately collected.

Miss Nightingale’s departure from the Crimea was accomplished with the greatest secrecy ; and her arrival in England was so thoroughly private, that the public were disappointed in their desire to receive her with the greatest demonstration of joy and gratitude, by learning that she had been honoured by an invitation to Balmoral, and had already been staying there for some days. The Queen desired to express her personal satisfaction, and to hand to Miss Nightingale, as a mark of Her Majesty’s highest approbation, a superb cross of St. George, with the crown and the initials of the Queen in diamonds. The cross is to be worn rather as an order than as a simple ornament, and, with various allegories, bears the motto, “Blessed are the merciful.”



Soon after Miss Nightingale's departure from the Crimea, an immense marble cross was raised on the height of Balaclava, so as to be seen at a great distance at sea. On the foot of the cross is inscribed, "Lord have mercy upon us," which is repeated in Russian and in French. It was soon known that this sacred monument had been raised to the memory of the dead by the pious care of Miss Nightingale.

This short treatise was in the printer's hands when our attention was called to a new work by Miss Nightingale: her "*Observations on the Sanitary State of the Army in India.*" A most admirable book, condensing into a small space all the most important points of the Stational Returns of the Commanding, Engineering, and Medical Officers of India, and bringing before the public, in her clear, laconic style, all the consequences of the absence of proper hygienic measures, as well as of the neglect of intellectual occupation for the men in India. The national feeling has been roused by Miss Nightingale's observations, and the most important reforms are become not only urgent, but compulsory—the sanitary condition of the whole country will be improved, and the soldier will be better formed and prepared for the exigencies of war. Thus India, instead of being the burial-ground, will become the nursery of the British army. This new work will render more service than can at once be appreciated, and, with the History of the Crimean War, will transmit Miss Nightingale's name to future ages as one of the greatest benefactors of her country.



DU  
**TRANSPORT DES BLESSÉS**  
ET  
**DES MALADES**

PAR  
**LES VOIES FERRÉES ET NAVIGABLES;**

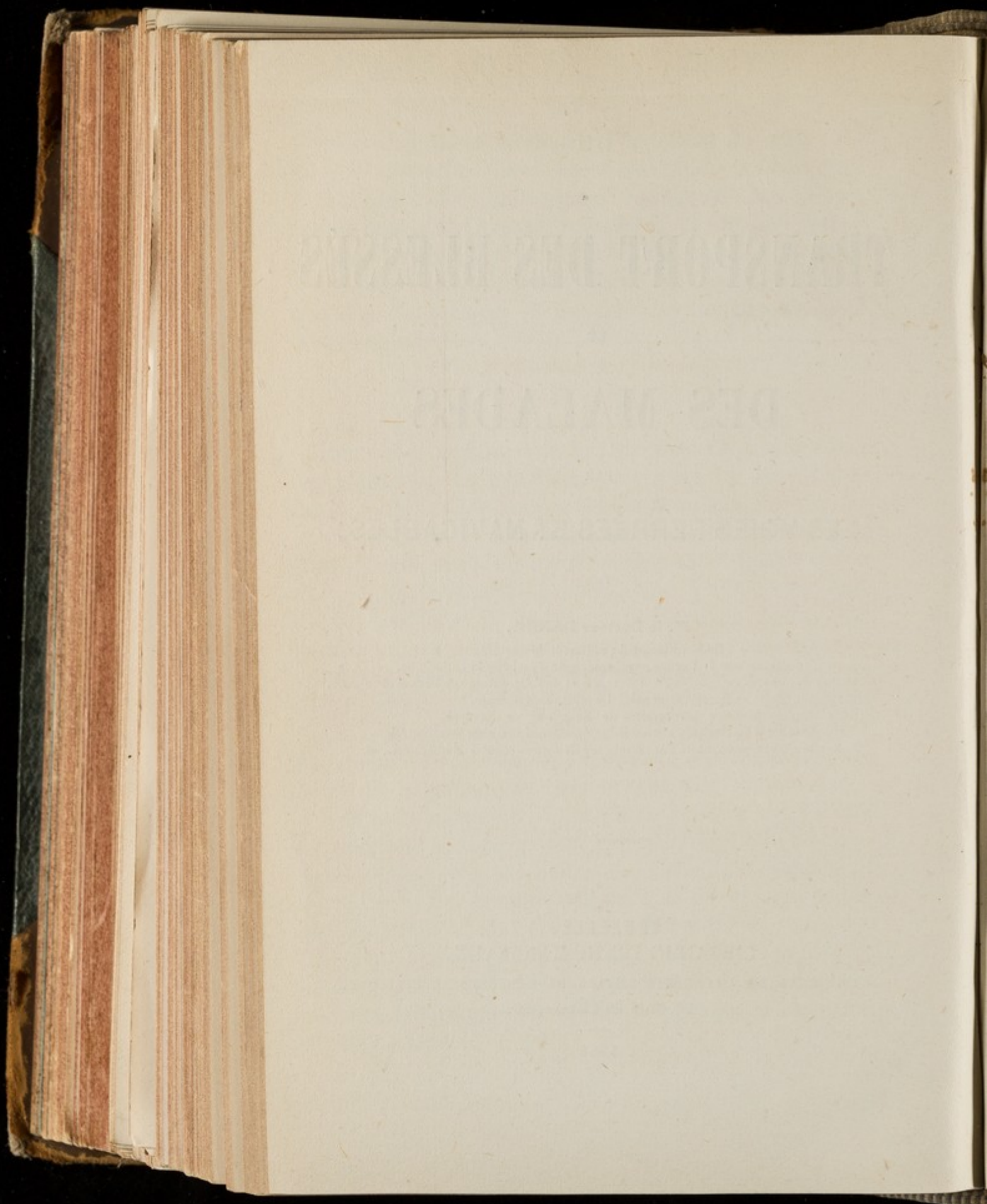
PAR  
**M. le Docteur LANDA,**  
Médecin major du régiment de Castille,  
Commandeur de l'ordre royal américain d'Isabelle la Catholique,  
Chevalier des ordres de Charles III d'Espagne, et de l'Aigle rouge de Prusse (3<sup>e</sup> classe),  
Décoré de la médaille militaire d'Afrique,  
Membre des comités de Madrid et de Navarre,  
Membre d'honneur du comité belge de secours aux blessés militaires,  
Membre correspondant de l'Académie royale de médecine de Madrid, etc., etc.

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**BRUXELLES,**  
**LIBRAIRIE DE H. MANCEAUX,**  
IMPRIMEUR DE L'ACADÉMIE ROYALE DE MÉDECINE DE BELGIQUE,  
20, Rue de l'Étuve, 20.

—  
1866







A M<sup>r</sup> le D<sup>r</sup> Longmore

souvenir de respectueuse affection

et Landon

### SYSTÈME D'ÉVACUATION.

I. Les équipages qui emportent au loin, souvent à des distances considérables, les blessés et les malades, les vivres et les munitions, ainsi qu'une foule de gens et une masse d'effets de toute nature, ont été de tout temps des obstacles sérieux aux manœuvres des armées qu'ils exposent singulièrement aux surprises de l'ennemi. Les Romains, qui se connaissaient dans l'art de la guerre et dont les aigles ont été promenées de l'Italie dans le monde entier, appelaient avec raison les trains militaires *impedimenta* (empêchements); et, c'est peut-être le nom qui leur convient encore le mieux de nos jours, car ils sont devenus plus embarrassants à mesure que le progrès de la civilisation a demandé qu'on s'occupât davantage du bien-être du soldat. Cette vérité n'a pas échappé à Napoléon I<sup>er</sup>. Ce grand capitaine, — se rappelant probablement les batailles de Lodi, Monttenotte et d'Arcole où le peu de bagages permit à ces vaillants bataillons républicains de faire des évolutions aussi rapides qu'étonnantes qui assurèrent la victoire, et les désastres de la retraite de Russie qui furent aggravés encore par la prise par les cosaques d'un grand nombre d'équipages quand s'écroula le dernier pont de la Beresina, — exprima dans ses *Maximes de la guerre* le désir d'avoir des soldats capables de porter sur le dos leur ration de blé pour vingt jours, et une hache à la ceinture.

C'est sans nul doute ce manque d'*impedimenta* qui donne tant d'avantage aux insurgés des campagnes et aux guerrilleros des montagnes et qui a été si favorable à nos audacieux ennemis dans les sables de l'Afrique et dans la *Manigüa* de Saint-Domingue.

Or, de tous les équipages le plus considérable et le plus intéressant, est celui des blessés et des malades. C'est précisément cet équipage que nous pouvons supprimer en mettant à contribution les puissantes ressources de



transport que le développement incessant des voies ferrées et navigables nous offre aujourd'hui.

II. Dans les guerres du dernier siècle, on entassait par milliers les malades et les blessés dans des charrettes mal soutenues, couchés sur quelques misérables bottes de paille souvent pourrie, sans autre abri qu'une couverture, exposés au soleil, au froid, à la pluie, sans nourriture et pour toute boisson dans la journée, comme le dit si bien M. le docteur Colombier, une méchante bouteille de tisane (1).

D'après M. le général Marquis de la Mina (2), c'est un acte de charité mal entendue que d'emporter les blessés dans les retraites. Il conseille de les abandonner avec quelques chirurgiens pour les secourir et munis d'une lettre adressée au général ennemi pour qu'il lui plaise de les traiter avec tous les égards possibles. M. le Marquis de la Mina se fait illusion et il a le grand tort, n'écoutant que son excellent cœur, de trop compter sur l'humanité d'un adversaire. Ignore-t-il par hasard que souvent les malheureux blessés sont devenus de la part des vainqueurs l'objet d'excès les plus atroces, sous prétexte de représailles ! L'histoire est pleine des récits les plus douloureux qui le prouvent surabondamment.

Mais en supposant qu'on n'ait rien à craindre de la part du vainqueur, que celui-ci ne demande qu'à pouvoir grossir le nombre de ses prisonniers et qu'il se conforme également en tous points à la convention de Genève, est-ce digne et équitable de lui abandonner le soin de pourvoir à l'assistance des blessés et des malades d'un adversaire. Le peuple athénien était plus scrupuleux à cet égard. Il condamna à mort les généraux qui venaient de saccager la flotte Lacédémonienne près des îles Argynseuses devant Lesbos, parce qu'ils avaient laissé périr sans secours les soldats qui étaient tombés à la mer, et cela malgré l'éloquente défense d'Euryptolème qui tâcha de justifier cet abandon par la nécessité de poursuivre le vaincu.

Le dilemme qui se pose entre l'impossibilité matérielle d'emporter ses malades et ses blessés et la défense morale de les abandonner, trouve sa solution dans le système des évacuations périodiques et fréquentes, mais pour que ce système soit réellement efficace, il faut évacuer non-seulement hors du *front stratégique*, mais aussi hors de la *zone d'opérations*, hors de l'*échiquier* de la guerre.

III. Il est un axiome élémentaire en stratégie, c'est qu'avant de marcher sur son *objectif*, toute l'armée doit s'assurer une bonne *base d'opérations*,

(1) Docteur Colombier. *Médecine militaire*.

(2) *Maximas para la guerra*, por el general Marques de la Mina.



c'est-à-dire une contrée d'où elle peut tirer facilement ses vivres et ses renforts et où elle sait se réfugier en cas de revers. Cette *base* sera un port dans la plupart des guerres contre puissances non enclavées dans l'intérieur de l'Europe, comme Balaklava le fut pour les alliés en Crimée, Gênes pour les Français en Italie, et Ceuta pour nous au Maroc. Ce sera toujours un port dans toutes nos guerres offensives, car l'Espagne est une nation péninsulaire et une grande puissance coloniale.

On conçoit qu'une *base maritime* soit la plus convenable pour toute nation qui possède une flotte. En effet, elle permet, ce qui est très-avantageux, de pouvoir tracer parallèlement à la côte sa *ligne d'opérations*, comme nous l'avons fait au Maroc : on trouve toujours une base prochaine dans les vaisseaux de l'escadre et l'on n'a qu'un flanc à surveiller.

Les auteurs militaires subdivisent les *lignes d'opérations* en *concentriques* et *excentriques*, en *intérieures* ou *extérieures*, et en *stratégiques* ou de *communication*(1). Quelle que soit l'espèce de lignes qu'on adopte, il est d'axiome qu'on doit maintenir libre la communication entre elles et la *base*.

Il n'y aura donc guère de difficultés à évacuer régulièrement chaque jour sur la *base* les malades et les blessés du *front stratégique* (qui change souvent) et de la *zone d'opérations*, en employant les brancards, les cacolets, les litières, les caissons, les voitures et tout ce qui constitue le matériel ordinaire de transport des ambulances.

Bien que ce mode d'évacuation soit très-favorable à l'armée expéditionnaire, il laisse cependant à désirer en ce sens qu'il embarrasse un peu les mouvements du général dans la contrée qu'il a choisie pour sa *zone d'opérations* en surchargeant sa *base*.

Autrefois les bases d'opérations étaient fixes, situées près des frontières et les armées y faisaient des *quartiers d'hiver* ; mais aujourd'hui, grâce aux chemins de fer, elles se déplacent souvent avec une rapidité surprenante.

Après chaque bataille, le front stratégique avance ou recule de plusieurs lieues, selon que la guerre est offensive ou défensive. Ainsi en France, il passe de la Moselle à la Seine ; en Italie, du Tessin au Mincio ; dans les duchés, du Danewerke à Duppel ; en Espagne, de l'Ebre au Vidasoa.

Le grand espace qu'occupe aujourd'hui la zone d'opérations, en raison de la multiplicité et de la facilité des moyens de communication et de l'étendue des fronts stratégiques (à Solferino, il était de cinq lieues), rend difficile le passage à la base. Cette base change souvent ; une armée

(1) N. Villiaume. *L'esprit de la guerre*. Paris 1864.



est parfois obligée d'aller chercher une base à une extrémité opposée. Ainsi, lorsque le maréchal O'Donnell marchait de Tetouan sur Tanger, nous évacuâmes sur cette première ville nos blessés de la bataille de Ouad-Ras, avec l'intention d'emporter avec nous jusqu'à la baie de Jeremie les hommes qui seraient blessés à la bataille que nous attendions à Fondak.

Dans l'expédition contre Montechristi, le général Gandara emporta ses blessés pour les embarquer à Port-Plata après la prise de cette ville. Enfin, le général Sherman se conduisit encore de la même manière dans son admirable expédition de Savannha.

Il résulte de ce qui précède qu'on ne peut compter sur aucun endroit de la contrée où se meuvent les belligérants pour y établir des hôpitaux fixes. Les points qu'on pourra y occuper successivement, sur le littoral ou à l'intérieur, seront les uns trop restreints, les autres trop pauvres, et tous exposés à être abandonnés à cause de l'éloignement du gros de l'armée.

Il faut aussi tenir compte ici des proportions considérables que prennent de nos jours les croissances des besoins hospitaliers déterminés par le perfectionnement des armes et l'augmentation toujours grandissante du nombre des combattants. M. Vaydi estime que dans les circonstances les plus favorables, une armée de cent mille hommes en campagne aura dans les hôpitaux le dixième de son effectif, soit cinq à six mille malades et trois à quatre mille blessés : que, après une bataille la proportion sera inverse, et même quand elle aura vaincu, elle se trouvera avec dix à douze mille blessés qui, ajoutés aux dix mille malades, font un total de vingt-deux mille hommes dans l'hôpital et cela sans compter ceux que l'ennemi a dû abandonner dans sa retraite. Les opérations d'un siège produisent aussi un grand nombre de blessés et de malades, en sorte qu'à la fin d'une campagne on trouve dans l'hôpital le troisième ou la moitié de l'effectif (1).

L'expérience des dernières guerres confirme malheureusement l'exactitude des chiffres produits par M. Vaydi, et l'on ferait bien de ne pas les perdre de vue quand on se prépare à une campagne ; en agissant ainsi, on ne verrait pas les illusions dont on se berce encore souvent, se changer en amères déceptions.

Nous ajouterons que les hôpitaux sont toujours coûteux et difficiles à desservir dans un pays envahi ou conquis, et le meilleur d'entre eux ne vaut pas le moins bien organisé de ceux qui sont situés en dehors du théâtre de la guerre. Sur ce dernier et dans les places contestables et peu sûres, il ne faut jamais établir que des hôpitaux provisoires, des tentes ou des baraques ; de véritables dépôts de blessés et de malades qui seront évacués

(1) Rossignol. *Hygiène militaire*. Paris 1857.



dans le plus bref délai sur la mère patrie, sur le terrain pacifique d'une colonie ou d'une puissance amie ou neutre. Ce système qui, il y a quelques années, eut été tout à fait impraticable, est aujourd'hui d'une exécution facile, grâce au développement des voies ferrées et navigables, et à l'invention des hôpitaux flottants et des trains-hopitaux.

IV. On pourrait craindre que le déplacement rapide d'hommes souffrants serait de nature à aggraver leur état et à retarder leur guérison; mais il n'en est rien, il est au contraire très-salutaire au plus grand nombre d'entre eux. Enlever un homme du lieu où il a contracté une maladie, n'est-ce pas lui faire faire la moitié du chemin qui le conduit à la santé? Qu'on réfléchisse un instant aux effets désastreux de l'encombrement qui se produisent nécessairement dans un hôpital d'une place prise d'assaut ou d'un village abandonné, et qu'on songe à l'absence de tous les objets nécessaires pour administrer les secours indispensables, et l'on sera convaincu de l'utilité d'un changement de lieu aussi rapide que possible.

Tous les blessés peuvent être transportés sans inconvénients, quand on le fait avec ordre et méthode et ce transport est très-favorable surtout aux malades qui souffrent des maladies des camps, comme le typhus, les fièvres intermittentes, le scorbut, la dysenterie et le choléra même. Ce fait a été constaté par M. le docteur Colombier qui le consigne en ces termes :

« Les premiers essais pour transporter les malades avec les régiments, furent tentés sous l'empire de la nécessité : en 1758, les fièvres malignes de l'automne se prolongèrent jusqu'à ce que l'armée dut se retirer du Hanovre pour aller à Mayence. Comme nos hôpitaux étaient encombrés de malades, nous fûmes obligés d'en évacuer plusieurs afin de ne pas les laisser entre les mains de l'ennemi. D'autre part, la distance de ceux qui nous restaient, l'incertitude d'y trouver place et la crainte d'être faits prisonniers, obligea la plupart de ceux qui tombaient malades en route, à suivre leur régiment. Ce fut alors qu'on observa dans ceux qu'on avait fait sortir des hôpitaux ainsi que dans les nouveaux malades un mieux extraordinaire, plus marqué chaque jour, en sorte qu'ils furent bien moins à plaindre que leurs compagnons restés aux hôpitaux. »

Le docteur Andrés y Espala a observé le même fait dans les hôpitaux flottants de Saint-Domingue. « Malgré l'encombrement des malades, on observa une modification très-remarquable des maladies... On fut étonné quand on vit débarquer sans aide après six jours de traversée, les dysentériques qu'on dut porter à bord sur un brancard et qui pendant les deux premières journées à peine pouvaient tolérer des demi-tasses d'un bouillon



léger. Cette influence de la navigation ne fut pas moins remarquable sur les malades atteints de la fièvre intermittente : le jour du départ et le lendemain nous avons observé plus de deux cent trente fiévreux, tandis que le jour de l'arrivée il n'y avait plus que quarante hommes atteints de cette fièvre rebelle dont ils souffraient depuis trois ou quatre mois... Les ulcères et les blessures se modifièrent aussi favorablement... On n'observa pas une influence si évidente sur les autres maladies (1). »

On obtient non-seulement à l'aide du déplacement l'amélioration de l'état des malades, mais on préserve en même temps la santé de l'armée et du peuple, puisqu'on empêche le développement d'épidémies meurtrières : telles que le typhus qui, en Crimée, enleva à l'armée française trente-cinq mille hommes pour l'hôpital et dix-sept mille cinq cent quinze pour le cimetière (2). Aujourd'hui on peut éviter ce fléau ; de sorte que son apparition sera désormais une preuve de grande imprévoyance ou de grande insuffisance.

Le système de la *dissémination* immédiate des blessés et des malades que nous préconisons est celui qui, dans la campagne d'Italie, a préservé les belligérants et le pays des affreux ravages d'épidémies mortelles ; mais comme le fait remarquer l'honorable médecin en chef de cette guerre, l'illustre baron Larrey. « Il faut rappeler seulement que le principe de la dissémination s'est complété *pendant* et après la campagne par une mesure *inséparable* de ce principe, c'est-à-dire l'évacuation des malades et des blessés, difficile quelquefois par l'insuffisance ou la pénurie du matériel et des moyens de transport, par l'assistance tardive du personnel, mais *toujours nécessaire*, lorsqu'elle est bien exécutée pour désenfler les hôpitaux et prévenir les fatales conséquences de l'encombrement. Si les brancards, les cacolets et les voitures d'ambulance nous ont parfois manqué, nous avons trouvé partout le dévouement ingénieux qui invente et multiplie les ressources, jusqu'à ce que l'intervention rapide des chemins de fer et des bateaux à vapeur eut garanti complètement et achevé l'œuvre des évacuations. — C'est ainsi qu'a pu s'effectuer progressivement, sans embarras, sans désordre et sans les malheurs incalculables des épidémies, la suppression graduelle de tous les hôpitaux improvisés en Italie (3). »

On voit donc que les évacuations des blessés et des malades sont avantageuses à la fois sous le rapport sanitaire et stratégique, qu'elles harmonisent

(1) *Revista de Sanidad Militar Espanola*. Madrid 1865.

(2) Serive. *Relation de la campagne d'Orient*. Paris 1857.

(3) Discours du Baron Larrey. *Bulletin de l'Académie impériale de médecine*. Paris, vol. XXVII.



les intérêts de l'humanité avec ceux de la politique, qu'elles satisfont en même temps les vœux du général et ceux du médecin, et nous permettent de voir l'accord le plus parfait entre les prescriptions hétérogènes de la science de guérir et de la science de la guerre.

V. La dernière objection qu'on pourrait opposer à ce système vient d'être levée par un acte diplomatique. Il y a un an encore, on aurait pu craindre pour une armée se trouvant éloignée de sa base d'opérations, que ses équipages de blessés ne tombassent entre les mains de l'ennemi qui augmenterait ainsi le nombre des prisonniers, et que les évacuations qui ne seraient protégées par des forces considérables, ressembleraient beaucoup à l'abandon des blessés. Aujourd'hui, nous avons la convention internationale de Genève ratifiée par quinze puissances, lesquelles s'engagent solennellement à reconnaître la neutralité des blessés et de ceux qui vont les secourir.

Cette convention humanitaire est destinée à être une des pages les plus honorables de notre époque, une des gloires les plus pures de notre siècle, dont la postérité conservera le souvenir ; aussi, je considère comme la meilleure fortune de ma vie, celle d'avoir eu l'honneur d'être un des premiers à réclamer et à soutenir au nom de l'Espagne que les blessés, des hommes incapables de se défendre, ne doivent et ne peuvent être faits prisonniers (1).

Le dernier paragraphe de l'article 6 de cette convention est rédigé comme suit :

« LES ÉVACUATIONS, AVEC LE PERSONNEL QUI LES DIRIGE, SERONT COUVERTES PAR UNE NEUTRALITÉ ABSOLUE. »

L'Europe civilisée a décrété par ces deux lignes qu'il n'y aura plus à l'avenir de typhus dans les places assiégées, ni dans les camps retranchés. Grâce à ce paragraphe, qui suffit à lui seul pour faire bénir la Convention de Genève par tous les amis de l'humanité, il n'y a plus d'encombrement de blessés ou de malades possible, cette source certaine d'épidémies meurtrières. Au lieu d'entasser les malades dans les casemates ou les tranchées, on les fera sortir périodiquement, en traversant s'il le faut les rangs de l'ennemi, qui, à leur passage, présentera les armes au courage malheureux, et ils pourront aller en paix chercher la santé au sein de la patrie.

Ainsi donc, aujourd'hui, toute armée régulière doit être pourvue des puissants moyens de transport des malades que nous avons à notre dispo-

(1) *Compte rendu de la Conférence internationale de Genève. Genève, 1863.*



sition, et puisque la stratégie, l'administration, l'hygiène, la thérapeutique, la dignité nationale et la charité chrétienne demandent l'adoption du système des évacuations des blessés hors du théâtre des opérations militaires, c'est un besoin impérieux que de posséder comme une partie du matériel sanitaire, de bons hôpitaux flottants et de bons waggons d'hôpital.

Nous passons, sans autres considérations, à l'étude des conditions que les uns et les autres doivent réunir.

### HOPITAUX FLOTTANTS.

#### *Partie historique.*

#### 1. — *L'Ordre de Saint-Jean de Jérusalem. — La Guerre de Succession. — Le Directoire. — Campagne de Turquie.*

Les hôpitaux flottants employés comme auxiliaires d'une armée ou d'une escadre d'opérations sont de nos jours une institution, dont on trouve peu d'antécédents dans l'interminable série des guerres. Il est peu probable qu'un semblable perfectionnement dans l'assistance des blessés et malades aurait pu être connu ni même soupçonné dans les temps où les hommes exclusivement préoccupés des moyens de nuire à l'ennemi, ne se mettaient pas en garde contre les maux qui pouvaient les atteindre. Il n'est donc pas surprenant que dans aucun des faits guerriers enregistrés par l'histoire ancienne, nous ne trouvions rien qui révèle l'existence de pareils établissements, à moins qu'on ne veuille tenir compte de la galère de 50 rames, qui, équipée à ses dépens et bien pourvue de médicaments salutaires, emportait Nèbre, le grand-père d'Hippocrate, quand il alla en guerre contre les Cryséens (1).

Si des temps antiques nous passons à notre ère, nous ne trouvons tout d'abord rien à signaler : l'assistance sanitaire et l'art de la navigation étaient trop peu avancés. Les grandes armées qui, au cri de *Dieu le veut*, s'élançaient sur l'Orient poussés par une force mystérieuse, allèrent d'abord par terre, et ce n'est qu'à partir de la quatrième croisade que nous voyons ces preux guerriers monter les vaisseaux de Venise.

Mais nous trouvons dans cette époque une institution qui a dû pressentir, sinon réaliser l'établissement des hôpitaux maritimes : c'est l'Ordre de Saint-Jean de Jérusalem, qui, avec celui de Saint-Lazare et l'Ordre teutonique, formait une légion sacrée de guerriers-moines qui ont acquis, comme le dit son historien, une gloire, aussi grande par les pieux services

(1) *Oratio Legati Thesali filii Hippocratis, ad Athenienses.*—Hip. Op. Venetiis, M. D. LXXV.



qu'ils ont rendus dans les hôpitaux que par leurs prouesses belliqueuses dans les camps (1).

Mais cet Ordre hospitalier ne prit le caractère marin qui plus tard le distingua tant, que lorsque ses chevaliers furent chassés du sol de la Palestine par la perte de Saint-Jean d'Acre, en 1291 : ils établirent alors un hôpital dans l'île de Chypre, plus tard dans celle de Rhodes, et enfin dans celle de Malte. Cette nouvelle condition de lieu les obligeait à reconquérir leur splendeur par les chemins de la mer, et bientôt les galères prises aux Turcs servirent de noyaux à l'escadre imposante, qui portait sur ses mâts le drapeau rouge à la croix blanche. Alors les chevaliers voués au rachat des captifs par la force des armes, ont eu mainte occasion de transférer à l'hôpital de Malte leurs propres blessés, ainsi que les nombreux captifs dont la santé avait besoin d'être refaite, après avoir souffert les cruels traitements qu'on faisait subir à ceux qui étaient aux bagnes d'Alger et ceux qui ramaient dans les galères de l'Uchali et que Cervantes nous a décrit *de visu*.

Pour appuyer cette hypothèse, qu'il nous suffise de citer un fait de l'histoire de cet Ordre où l'on trouve les hôpitaux flottants sur une petite échelle. Toutefois, quand, en 1565, Malte était assiégée par les Sarrasins dont l'escadre était commandée par le fameux corsaire Dragut, on commença l'attaque par le fort Saint-Elme détaché de la ville et défendu par le chevalier Broglio, avec quelques troupes de l'Ordre, parmi lesquelles deux compagnies auxiliaires d'Espagnols. Le grand-maître La Valette qui soutint ce siège avec tant de gloire, décida alors que quelques bateaux iraient tous les soirs à Saint-Elme pour y prendre les blessés de la journée et les transférer à l'hôpital qui se trouvait dans le bourg de Malte; il évita ainsi des embarras à la garnison du fort (2).

Après les vaisseaux de Saint-Jean on n'en trouve plus qui aient servi d'hôpital dans les guerres faites en Europe jusqu'à la fin du dernier siècle. Comme presque toutes ces guerres étaient continentales, on ne saurait apprécier l'utilité d'une institution qui ne présente des avantages réels que dans les campagnes sur le littoral.

Au milieu du dernier siècle, dans la guerre de succession on eut à faire quelques translations maritimes ou fluviales de malades militaires. Le chevalier Pringle raconte que quand les Anglais finirent la campagne de 1745, on résolut que tous les malades qui se trouvaient dans plusieurs hôpitaux improvisés aux alentours de Worms, seraient transférés en Flandre. Ce

(1) Michaud, *Histoire des croisades*.

(2) *Histoire de l'Ordre de Saint-Jean de Jérusalem*, par l'abbé V.



transfert eut lieu jusqu'à Gand dans des bateaux appelés *belandes*, mais malheureusement pendant la traversée la moitié des malades succomba, victimes de la fièvre typhoïde qui sévissait parmi eux, le même malheur atteignit les malades qu'on transférait de Oosterhout à Ypswich à la fin de la guerre (1).

Il faut arriver à l'époque de la révolution française pour trouver consignée officiellement l'idée et la dénomination de vaisseau-hôpital. Un décret du Directoire dans lequel on trouve l'empreinte de cet esprit philanthropique qui appartient à ces législateurs inspirés tour à tour par la philosophie des Grecs et par les idylles sentimentales de Saint-Pierre et de Rousseau, organisa le 7 vendémiaire de l'an VIII le service sanitaire de la flotte consacrant aux hôpitaux flottants un de ses titres dont la teneur est comme suit :

TIT. XX. — VAISSEAU-HOPITAL.

Art. 209. Il y aura, tant que possible, dans chaque escadre de neuf vaisseaux de ligne, un vaisseau-hôpital, et deux dans celles de vingt à vingt-cinq vaisseaux.

Art. 210. Le vaisseau-hôpital sera arrangé dans la forme la plus convenable pour le bien-être des malades.

Art. 211. Le nombre des officiers de santé embarqués dans ce vaisseau sera proportionnel à celui des malades qu'il pourra contenir, en sorte que chaque officier de santé n'ait à soigner plus de cent malades.

Art. 212. Le nombre des matelots sera réduit au nécessaire pour la manœuvre du navire.

Art. 213. Les cuisines seront préparées en sorte qu'on puisse faire aisément tout ce qu'il faudra pour les malades.

Art. 214. Il y aura des ventilateurs, et on fera toutes les ouvertures nécessaires pour la renovation de l'air.

Dans ces six règles, les législateurs du Directoire ont condensé tout ce qu'il faut faire pour qu'un vaisseau puisse servir d'hôpital, en renvoyant pour les détails d'exécution aux articles du titre XVI, où l'on parle des infirmeries particulières de chaque vaisseau de l'escadre. Quoique ce décret soit relativement parfait, il ne nous apprend cependant pas que l'application stratégique du transport des blessés des armées fut connue, puisqu'on en réduit l'usage à l'assistance des malades d'une division navale, usage sans grande utilité, du moment qu'on installe en même temps des infirmeries dans chaque navire. Enfin on *décréta l'existence* des hôpitaux flottants, mais elle resta *sur le papier*, même dans les grandes campagnes de Napoléon I<sup>er</sup>, qui toutes étaient continentales.

(1) Pringle. *Maladies des Armées*, vol. I.



Lorsque l'armée russe, commandée par le général Diebitsch, opérait dans la Turquie européenne, et après sa désastreuse campagne de 1829, nous trouvons qu'un vaisseau de ligne et deux frégates transportèrent 5864 malades, dont 600 pestiférés, de Kinburn à Ovidiopol, mais ces bateaux étaient des vaisseaux de transport et non des vaisseaux-hôpitaux.

## II. — Conquête de l'Algérie. — Guerre d'Orient.

C'est à l'époque de la conquête de l'Algérie par les Français qu'on trouve pour la première fois quelques bateaux-hôpitaux pour faire le service d'évacuation. On ne s'en servit pas pendant la guerre, mais longtemps après, alors que l'influence funeste du climat d'Afrique se faisait sentir parmi ses envahisseurs. M. J. N. Périer, officier sanitaire de l'armée française, en fait la description suivante (1) :

« Heureusement et profitant de l'exemple et des leçons de l'expérience, nous avons enfin quelques bateaux-hôpitaux, et désormais les évacuations de malades ne seront plus aussi funestes qu'elles l'ont été jusqu'ici. Mais il conviendrait beaucoup de faire accompagner chaque évacuation par un médecin de l'armée, habitué au traitement des affections de ce pays. Malheureusement il n'y a que trois de ces vaisseaux et comme on en profite pour le transport des troupes, ils ne peuvent suffire à toutes les éventualités ; voilà pourquoi il faudrait arranger aussi quelques bateaux à vapeur qui pourraient servir de casernes quand on ne ferait usage des navires à voiles. On conçoit aussi que ces vaisseaux pourraient être utilisés, soit dans certaines épidémies, soit comme infirmerie pour les convalescents auxquels on fournirait de la sorte les avantages d'un changement d'atmosphère et de voyage maritime. »

Ces paragraphes démontrent assez, combien devait être imparfaite l'organisation de ce service qu'on essayait pour la première fois dans l'armée qui en avait le plus besoin ; puisque M. le docteur Boudin (2) nous fait savoir que dans l'année 1841 on évacua d'Algérie en France 6,266 malades, dont 41 succombèrent pendant la traversée : et que depuis 1840 à 1845 on évacuait à peu près 5,507 malades chaque année.

Pendant la campagne de Crimée le transport maritime de malades prit des proportions colossales. Il avait des hôpitaux, des tentes et des baraques au camp allié, à Kamiech et à Balaklava, mais ils n'étaient que des dépôts d'embarquement pour les grands hôpitaux de Constantinople. Il y eut des mois pendant lesquels on embarquait tous les jours 5 à 400 malades : et

(1) *De l'hygiène en Algérie*, par M. J. N. Périer.

(2) *Études sur la mortalité en Algérie*, par M. le docteur Boudin. Paris, 1847.



cela même n'était pas assez, puisque M. l'inspecteur Baudens nous dit (1) que « le transport des malades de Crimée à Constantinople était même trop long, et il fut nécessaire d'ouvrir des nouveaux hôpitaux pour les recevoir : en octobre de 1855 l'on en établit un avec 1,200 lits à Ramio Tchiflik et un autre à Pera : dans les mois suivants on ouvrit des hôpitaux pour 6,700 malades, sans compter la caserne de Maslask destinée aux convalescents. Pendant cette période on continuait à envoyer en France les réformés dont on dut en transporter 6,000 dans un seul mois. Au lieu de retourner en Crimée, la moitié de nos vaisseaux se faisait à la voile pour Marseille ou Toulon, et de la sorte beaucoup de fiévreux durent rester en Crimée. Dans cette crise, le typhus envahit les malades et fut importé en France. »

Grande devait être la mortalité pendant ces traversées, puisque M. le docteur Bryce (2) affirme, sous le rapport de plusieurs médecins français, que plusieurs centaines de malades embarqués à Kamiech pour les hôpitaux du Bosphore, ne dépassèrent pas la moitié du canal, et M. Baudens déclare qu'il y eut une époque où il mourait 200 soldats entre Crimée et Constantinople.

M. Scribe, médecin en chef de l'armée française pendant cette grande guerre, nous a laissé la description de la manière avec laquelle on faisait le service des évacuations maritimes : « Nos évacuations par mer des malades et des blessés de Crimée ont eu lieu sur une échelle si vaste et dans un laps de temps si restreint, qu'il est nécessaire de produire des chiffres pour en donner une idée exacte ; en vingt-deux mois, 444,668 malades ou blessés ont été évacués de la Crimée sur les hôpitaux de Constantinople ; les moyennes générales ont atteint 5,755 évacués par mois et 190 par jour : cette moyenne quotidienne a été de 550 en août et juin. Le mouvement mensuel maximum de tous les mois s'est présenté en juin avec le total de 10,600 évacués. On conçoit qu'il n'est guère possible dans des conditions de cette nature, d'avoir des bateaux installés en hôpitaux et suffisant à ce service gigantesque d'évacuations par mer : on peut le démontrer par le calcul. En effet, pour faire régulièrement face aux besoins éprouvés par notre armée, il aurait fallu comme bateaux-hôpitaux, exclusivement employés à ce service spécial : 1° huit grands clipper à vapeur ou corvettes de charge pouvant contenir à l'aise 550 à 400 malades ; ils seraient partis régulièrement, l'un, de Kamiech, les jours pairs, l'autre, de Constantinople, les jours impairs ; la traversée étant en moyenne de trois jours pleins, et le chargement exigeant d'un à deux jours ; 2° douze autres bateaux-

(1) *Une mission médicale en Orient. — Revue des Deux-Mondes.*

(2) *England and France before Sebastopol from a medical point of view. 1857.*



hôpitaux de la même capacité, pour les évacuations de Constantinople sur Marseille ou Toulon, à deux départs par semaine, de l'une ou de l'autre de ces villes. Il aurait donc fallu distraire vingt grands navires à vapeur pour les convertir en bateaux-hôpitaux. La marine dont les ressources suffisaient à peine pour assurer le service de guerre, le transport des troupes et du matériel, ainsi que les approvisionnements de toute espèce, le pouvait-elle sans compromettre les intérêts plus graves du service général? Il a donc fallu employer pour les évacuations, soit les navires disponibles de l'État, soit, le plus ordinairement, des bateaux du commerce qui venaient à Kamiech déposer leur chargement de denrées et de matériel et s'en retournaient, chargés de malades, à Constantinople et en France plus tard. »

« L'impérieuse nécessité d'embarquer des malades et des blessés sur des navires non organisés pour ce service, l'obligation de les loger sur le pont quand le temps était beau et la mer calme, et dans les circonstances contraires de les coucher dans l'entrepont ou la cale, ont eu certainement une influence fatale sur un grand nombre de nos évacués, qui succombaient parfois pendant la traversée, ou qui arrivaient à Constantinople dans un épouvantable état (1). »

On voit donc que dans cette campagne, il n'y eut pas un véritable bateau hôpital : étrange défaut pour une nation aussi puissante, aussi éclairée que la France, et d'autant plus regrettable qu'on peut lui imputer une grande partie des malheurs que dut souffrir son armée.

### III. — Guerre d'Italie.

Dans la campagne de Lombardie, on avait prévu le besoin d'évacuer les malades, et l'on a fait suivre à l'armée française de quelques bateaux-hôpitaux, bien appropriés et exclusivement destinés à cet objet. Voici ce qu'en dit M. le docteur Suarez, médecin de la marine espagnole (2).

« Pendant les deux mois que nous sommes restés en rade de Gênes, nous avons vu partir pour Marseille, presque tous les soirs, un bateau-hôpital : ces bateaux *Colomb*, *Ulloa*, *Vauban*, étaient à aubes, de 500 chevaux au moins, ils portaient ordinairement 20 canons, mais maintenant ils n'en avaient que 2 pour faire des signaux : ils n'avaient que le tiers de leur équipage pour la manœuvre du vaisseau, mais par contre ils portaient un médecin en chef, deux médecins de 1<sup>re</sup> classe, deux de 2<sup>e</sup> classe, un pharmacien, neuf élèves et le nombre nécessaire d'infirmiers. Les batteries de ces

(1) Scrive. *Relation médico-chirurgicale de la campagne d'Orient*. Paris, 1857.

(2) *Memorial de Sanidad del Ejercito y Armada*. Madrid, 1859.



vaisseaux, dégarnies de leur artillerie, étaient converties en salles d'hôpital où se plaçaient en divers rangs des lits en fer d'une construction légère. Le *Ulloa* qui me paraissait être le plus grand de ces vaisseaux, contenait quatre rangs de lits dans la batterie de proue et cinq dans celle de poupe qui font un total de 160 lits. Les pieds de ces lits étaient vissés au sol, et on plaçait des bancs pour empêcher les malades de tomber dans les mouvements du roulis. La pharmacie était bonne, l'appareil chirurgical complet, et les approvisionnements de viande fraîche, etc., suffisaient pour deux jours, quoique la traversée n'était que d'un jour : on portait aussi des bateaux plats pour favoriser l'embarquement des malades. »

Voilà donc les premiers bateaux-hôpitaux vraiment dignes de ce nom : les premiers qu'on a exclusivement consacrés au service des évacuations des blessés : les premiers dont l'arrangement intérieur a été adapté aux besoins hospitaliers. C'est la France qui, la première, a reconnu le besoin de cette espèce de vaisseaux, après les tristes expériences et les coûteuses leçons d'Algérie et de Crimée.

#### IV. — *Expédition de Joló. — Campagne du Maroc.*

L'Espagne n'avait pu sentir le besoin de bateaux-hôpitaux dans les guerres de l'indépendance et dans la guerre civile, puisque toutes les deux avaient eu pour théâtre l'intérieur de son pays ; mais néanmoins elle avait adopté ce véritable progrès depuis 1851, lorsqu'une expédition sortie de Manille fit détruire à l'île de Joló les nids des pirates qui infestaient l'Archipel des Philippines ; cette expédition était accompagnée de deux bateaux-hôpitaux, les brikbarques *Amistad* et *Eurotas*, ayant un personnel et un matériel sanitaire complet ; et quand elle revint victorieuse à Zamboanga un autre bateau, le brigantin *dos Hermanos*, emportait les malades et les blessés. Perfectionnement remarquable du service sanitaire dont l'honneur revient au distingué médecin en chef Don Antonio Codorniu (1).

Lorsqu'en 1859 l'Espagne dut faire preuve de sa puissance renaissante et de son courage jamais terni, contre son ennemi traditionnel sur le sol de l'Afrique, son armée était suivie d'une respectable flotte sanitaire que nous avons décrite dans un autre ouvrage, dans les termes suivants :

On avait destiné au service d'hôpitaux flottants quatre beaux bateaux à vapeur à hélice nolisés par le gouvernement : c'étaient le *Barcelona*, de 4,000 tonnes ; le *Torino*, de 2,000 ; le *Cataluna*, de 1,500 et la *Ville de*

(1) Codorniu. *Diario de la expedicion contra Joló*. — *Bibliot. med. Castrense*, tome II.



*Lyon*, de 2,500. Les deux premiers étaient destinés à l'assistance des blessés et des malades ordinaires, les deux autres pour les cholériques : tous les quatre avaient été emménagés comme hôpitaux, en ayant dans l'entrepont deux ordres superposés de lits pourvus d'un matelas, de deux draps, d'une couverture et d'un oreiller; les cabines des passagers avaient été disposées pour recevoir les officiers blessés ou malades. Ainsi le *Barcelona* avait 200 lits, le *Torino* 500, la *Cataluna* 500 et la *Ville de Lyon* 600.... Le service médical était à la charge d'un médecin, chef de l'hôpital, assisté d'un aide-major, d'un pharmacien, de six élèves et de plusieurs infirmiers, deux officiers de l'intendance étaient chargés de l'administration. Le matériel sanitaire comptait un caisson de pharmacie, des objets de pansement, d'une boîte à amputations et de dix brancards. Les provisions étaient composées de vin, de biscuit et de viande conservée pour l'alimentation des malades. Mais malgré la bonne qualité de ces aliments, il faut reconnaître qu'ils ne plaisaient trop aux malades qui en avaient été rassasiés au camp; ils auraient préféré de la viande fraîche. Les cholériques dans les camps étaient transférés journellement aux hôpitaux de Ceuta et d'Algésiras dans les petits bateaux à vapeur chargés du service postal, mais comme ils n'avaient pas été arrangés pour servir d'hôpitaux, les malheureux cholériques étaient obligés d'aller coucher sur le pont, sans autre lit que les planches, sans plus d'abri qu'une couverture..... (1).

L'armée espagnole d'Afrique avait aussi un hôpital-ponton à l'ancre dans la baie de Ceuta : c'était le brigantin *Destino*, dont on profitait pour y placer les convalescents du choléra, quand la ville entière de Ceuta était bien forcée de se convertir en un vaste hôpital. L'entrepont de ce vaisseau complètement débarrassé, permit d'y placer 100 lits et autant dans le 2<sup>e</sup> entrepont; les lits étaient ceux qui servent au soldat dans les casernes et faute de les avoir vissés au sol, ils tombèrent quand le roulis fut un peu considérable. Quelques-uns critiquaient la mesure d'envoyer les convalescents du choléra dans un hôpital où ils pouvaient souffrir du mal de mer, mais il n'est à ma connaissance aucune rechute qui ait donné raison à ces critiques.

#### V. — Guerre civile aux États-Unis d'Amérique.

Les portes du temple de Janus étaient à peine fermées en Europe, que Belone agitait sa cravache sanglante sur les plaines fertiles du Nouveau-Monde. Le 12 avril 1861 le canon du fort Sumter inaugurerait cette guerre

(1) Landa. *La campaña de Marruccos*. — *Memorias de un medico militar*. Madrid, 1860.



homérique qui, après avoir désolé pendant trois années la patrie de Washington, s'est heureusement terminée par le triomphe de la justice et l'émancipation des millions d'esclaves dont l'existence était une tache infamante pour le pays où législa Franklin.

Quand on songe à l'immense développement que le patriotisme de ce peuple inexpérimenté a su donner à tous les éléments de la guerre et à la rapidité avec laquelle son génie industriel sans entrave a su accumuler en si peu de temps tous les moyens matériels de s'assurer le triomphe en les perfectionnant même jusqu'à l'exagération, on ne doit pas s'étonner que les hôpitaux flottants aient été mis en usage dans la guerre d'Amérique. Le département de santé de l'armée fédérale confié à un aussi savant médecin que le général Hammond, et la Commission sanitaire qui a su démontrer à quoi on peut arriver en réglant convenablement la charité et le patriotisme, ces deux institutions, l'une officielle et l'autre privée, ne pouvaient, dans leurs ardentes recherches pour le bien-être des soldats blessés et les malades, laisser dans l'oubli les bateaux-hôpitaux ; aussi elles les ont organisés de manière à ce qu'ils répondent à tous les besoins.

Le besoin des bateaux-hôpitaux se fit sentir dès le début de la campagne, puisque les opérations militaires durent prendre pour base les voies navigables. Si dans le Sud on trouve peu de chemins de fer et moins encore des voies carrossables, en revanche il a été doué par la nature de 50,000 kilomètres de rivières navigables. C'est ainsi que dans la première campagne du général Mac Clelan contre Richmond (1862), on voit ces vaisseaux à l'œuvre, affirmer son utilité ; 150,000 fédéraux étaient alors enfermés dans la péninsule de Yorktown, où la qualité marécageuse du terrain et l'épuisante corvée des tranchées malsaines plus encore que les escarmouches incessantes, déterminèrent cette mortalité qui a donné une si triste renommée au camp de la Chickaominy. Pendant cette campagne si savamment décrite par un prince d'Orléans (1), on portait les malades sur la rivière Pamunkey jusqu'à West-Point, où se trouvaient les hôpitaux centraux de l'armée ; mais ils furent bientôt encombrés et un terrible conflit serait survenu sans l'opportune intervention des hôpitaux flottants qui emportaient les malades par les rivières Pamunkey et York jusqu'au fort Munroe à l'embouchure de la Chesapeake. Là profitant de la brise rafraîchissante de la mer, et à douze heures seulement de Baltimore par la vapeur, ils purent obtenir tous les secours nécessaires, et s'il en était besoin être directement transportés au Nord (2).

(1) *Revue des Deux-Mondes*, Paris, 1865.

(2) *L'Œuvre d'un grand peuple*, par J. N. P. Paris, 1864.



L'honorable Moses J. Odell, membre du Congrès par la cité de Brooklyn (New-York) et témoin oculaire de cette campagne désastreuse de la Péninsule, jugeait dans ces termes, dans un de ses discours, le service rendu par ces bateaux. « A peine de quelque temps au village de Whitehouse, il nous vint de Fair-Oaks, dans une file de waggon, quelque cinq à six cents soldats blessés..... Je m'enrôlais comme membre actif de la commission sanitaire, pendant quatre jours et quatre nuits. Dans cet espace de temps 3,465 blessés furent admis : on pourvut à leurs besoins immédiats, les secours médicaux leur furent donnés, puis on embarqua ces hommes pour les hôpitaux de Washington et d'autres cités du Nord. Sans la présence de ces navires et des approvisionnements qu'ils contenaient, les souffrances de ces malheureux eussent été réellement indescriptibles (1). »

Nous trouvons toujours à l'œuvre les hôpitaux flottants, dans tous les engagements de cette guerre : nous voyons le steamer *City of Memphis* sur la rivière Cumberland, le grand vaisseau-hôpital *Louisiana* à Savannah, le *Laurel Hill* emportant sur le Mississipi les blessés du général Grant ; le vaste *Cosmopolitan* accueillir les blessés du fort Wagner et de Charlestown, ce dernier steamer fut arrangé en hôpital avec 325 lits, par le Dr Crâne, un des plus savants inspecteurs de la commission sanitaire.

Cette commission, de son côté, parvint à réunir une véritable escadrille hospitalière dont nous allons copier le dénombrement.

Bateaux à vapeur (*sea steamers*) pour le long cours : *S. R. Spaulding*, *Daniel Webster*, n° 1. Vapeurs côtiers (*Coast steamers*) pour de petites traversées : *Elm City*, *State of Maine*, *John Brooks*, *Commodore*, *Kehnebeck*, *Daniel Webster*, n° 2.

Vapeurs côtiers ne pouvant sortir au large : *Vanderbilt*, *Whilldin*, *Louisiana*, *Knickerbocker*.

Bateaux à voiles pour rester en pontons ou être remorqués : *St-Marc*, *Euterpe*.

Le jaugeage total de tous ces navires permettrait d'y loger 4,000 malades et en cas d'urgence jusqu'à 5,000. Au surplus la commission possédait quelques autres bateaux chargés d'effets de literie, de linge, d'aliments, de boissons et de médecines ; elle les faisait suivre par les rivières, les mouvements des armées, et de la sorte elle tenait toujours près d'elle un magasin de secours pour les malades et les blessés. Les steamers destinés à ce service furent le *Dunleith*, défrayé par les comités de secours de

(1) *La commission sanitaire des Etats-Unis*, par M. Thomas W. Ewans. — Paris 1865.



l'Etat de l'Illinois, le *Alice Dean* par ceux de Cincinnati, l'*Atlantic* par ceux de New-Albany, l'*Elizabeth* et le *Polar Star* (1).

Les steamers des fleuves américains sont particulièrement propres à être convertis en hôpitaux : ils ont un très faible tirant d'eau, toute la machine se trouve au-dessus de la ligne de flottaison, et comme ils forment une maison à deux ou trois étages avec des portes et des fenêtres, des galeries spacieuses, des grands salons et des nombreuses cabines, on peut y loger de 800 à 1,000 hommes, sans beaucoup d'embarras. Quelques-uns de ces bateaux atteignent des proportions énormes à ce que dit un voyageur qui les a vu tout récemment.

« Au quai de la ville de Saint-Louis je m'arrête devant le steamer *Mississippi*, dont les proportions dépassent tout ce que j'avais vu ou imaginé jusqu'ici, ses escaliers sont assez larges pour permettre à vingt hommes de passer de front, sa toiture est aussi élevée que la nef d'une cathédrale; ces bateaux de New-Orléans sont vraiment prodigieux (2). »

Nous finissons ce qui a rapport aux hôpitaux flottants des Etats-Unis, en transcrivant quelques paragraphes des lettres écrites par son organisateur, M. J. Olmsted, à la commission sanitaire, les faits qu'il y consigne démontrent une fois de plus combien sont pressants les besoins de la guerre, et combien il est indispensable d'y parer d'avance.

« Au bord de l'hôpital *Daniel Webster*. Baie de Cheeseman. Mai 1862.

» Nous avons ici, outre le *Webster*, le vaisseau fanal *Wilson Small* qui vient d'être arrangé comme petit hôpital, pour entrer dans les criques et transborder les blessés aux bateaux de transport..... Le bateau-hôpital *Ocean Queen* arriva samedi de Old-Point et quand j'ai passé près de lui, j'ai été surpris de voir qu'il a de chaque côté un petit steamer à roues chargé de malades qu'on va transférer à l'*Ocean Queen*; ces malades proviennent des régiments qui, la nuit dernière, ont dû décamper à l'improviste pour se porter en avant: à cette heure ils doivent être engagés à Williamsburg puisqu'on entend par là des coups de canon. Ces malades ont été envoyés pendant la nuit à Wormley's-Creek, où, à ce que me dit l'officier qui les conduit, il s'en trouve encore un grand nombre couchés sur le sol et dépourvus d'abri, d'aliments et d'assistance..... Il n'y avait pas une heure que nous étions à bord, et déjà pesait sur nous le soin d'une centaine de malheureux malades et moribonds, et nous n'avions que dix livres de farine de maïs pour les nourrir!..... En même temps arrivaient à

(1) *The sanitary commission of the U. S. Army : its Works and Purposes.* — New-York, 1864.

(2) Duvergier d'Hauranne : *Huit mois en Amérique.* — Paris, 1863.



Yorktown des convois de malades postés dans des charrettes, de plusieurs camps abandonnés dans les environs, et comme la section sanitaire n'était arrivée à la plage qu'après le départ de l'*Ocean Queen*, les pauvres malades se trouvaient couchés dans les rues fangeuses pendant qu'on préparait des tentes et quelques maisons pour les abriter. Enfin arrivèrent quelques waggons chargés d'effets d'hôpital tirés des magasins de la commission..... »

Voici ce que dit un autre agent de la commission après la bataille de Fair-Oaks :

« Juin 5. — Nous avons passé la nuit à aider les dames qui se sont constituées infirmières au bord de l'*Elm City* ; au retour le capitaine nous prévient que des centaines de blessés sont couchés sur la plage, que le *Daniel Webster* n° 2 en est déjà plein, que les autres entrent dans le *Wanderbilt*, que la confusion est grande puisqu'il n'y a de provision dans aucun de ces bateaux. Heureusement notre bateau-magasin *Elizabeth* arrive..... Le *Knickerbocker* a à son bord 550 blessés, comme la nuit est sereine on en a placé quelques-uns sur le pont, et quand je suis sorti tous avaient été lavés, déshabillés et couchés dans des lits, où on les a arrangés avec tout le confortable que les circonstances permettent : tous ont reçu la nourriture et les soins médicaux dont ils avaient besoin. Laisant le *Knickerbocker* dans cet état satisfaisant je retournais à terre et je vis en passant que l'*Elm City* a déjà 500 blessés à son bord (1). »

#### VI. — *Expédition espagnole au Mexique. — Guerre de Saint-Domingue.*

Tandis que la grande république américaine était déchirée par les horreurs de la guerre civile, on imposait à celle du Mexique une intervention européenne : trop peu définie d'abord, l'extension qu'on aurait à lui donner, l'armée espagnole devança ses alliées pour prendre possession de la Vera-Cruz, et entre autres apprêts dont elle manquait on peut compter les hôpitaux flottants dont le besoin se fit bientôt sentir. Pendant le cours de l'expédition on dut transporter de la Vera-Cruz à la Havane 1,400 malades ou convalescents de la fièvre, dans des bateaux nullement préparés pour ce service, et quand le corps d'armée espagnol évacua spontanément le territoire mexicain, le manque de ces hôpitaux flottants fut bien plus regrettable encore.

Le Dr Andres y Espala, un des plus distingués officiers médecins de l'armée d'outre-mer, a raconté son retour à l'île de Cuba avec le convoi de

(1) *Hospital transports a memoir, etc.* Boston, 1865.



500 malades sorti d'Orizaba : ils furent embarqués dans le bateau à vapeur *Alava*, dépourvu de literie et de vaisselle, où ils restèrent 24 heures sans nourriture, mais enfin on arriva à la Havane sans avoir aucune perte à déplorer. Moins heureux le convoi de 500 malades qui, quatre jours après s'embarquait à la Vera-Cruz sur la frégate d'hélice *Petronila* ne peut s'éviter le navrant spectacle de lancer dans l'eau neuf cadavres.

Peu de temps après l'Espagne se trouvait dans le triste devoir de combattre l'insurrection de l'île de Saint-Domingue qui, deux ans avant, avait fait croire à la spontanéité de son annexion. Comme l'importance de ce soulèvement fut méconnue d'abord, on ne fit pas tous les apprêts qu'exigeait une campagne aussi dure que celle qu'on y eut à soutenir. Les soldats espagnols vainqueurs des insurgés partout où ils les trouvaient étaient vaincus, de leur côté, par l'influence meurtrière du climat et encombraient bientôt les hôpitaux de l'île, il fallut les évacuer constamment sur Porto-Rico, Cuba, Nuevitas et la Havane. Ce ne fut qu'après avoir transporté 15,000 malades dans des bateaux dépourvus des conditions spéciales pour ce service qu'on décida l'installation des hôpitaux flottants que M. le docteur Andres y Espala décrit dans ces termes :

« Les bateaux-hopitaux étaient le steamer de guerre *San-Quintin* et celui de commerce *Cataluna*. Celui-ci, de même qu'au Maroc, est desservi par deux officiers médecins assistés de huit élèves; un ample approvisionnement d'instruments de médecine et de bandages permet de parer à tous les accidents qui surviendraient pendant la traversée. Un officier d'administration est chargé de pourvoir à l'alimentation des malades, à la lingerie, etc. Dans l'entrepont de proue 70 lits sont disposés en quatre rangs parallèles, il est assez bien ventilé par ses 14 fenêtres pendant le jour et par deux manches à air pendant la nuit. La capacité moindre de l'entrepont de poupe n'y a permis de placer que 55 lits, il a peu de fenêtres et on a soin de n'y placer que les malades moins graves qui pourront monter quelques heures sur le pont : deux manches à air suffisent à peine pendant la nuit pour atténuer la chaleur excessive et la viciation de l'air dont on s'aperçoit dès qu'on ferme les fenêtres. Le reste des lits jusqu'à 200 est réparti dans quelques soutes où il y a trop peu de ventilation et quand les malades dépassent ce nombre, comme il advient très-fréquemment, il faut les placer sur le tillac, sur le pont et même dans les canots qui sont suspendus de chaque côté du bateau. La tiédeur de l'air pendant les nuits fait que les malades ne se ressentent pas de cette disposition et pendant le jour une grande toile les abrite contre l'ardeur du soleil ou de la pluie (1).

(1) *Revista de sanidad militar*, n° 50.— Madrid, 1865.



VII. — *Guerre au Schleswig-Holstein.*

Dans la dernière campagne soutenue par la Prusse et l'Autriche contre le Danemark on a fait des évacuations maritimes de part et d'autre, mais sur une petite échelle; ni le nombre des blessés, ni la durée de la campagne, ni la longueur du trajet de la ligne d'opérations à la base n'ont eu de proportions assez vastes pour nécessiter l'installation d'hôpitaux flottants d'une manière spéciale comme dans les guerres que nous venons d'examiner en Europe et en Amérique. On sait seulement que les blessés de l'armée danoise étaient évacués des hôpitaux de l'île d'Alsen dans les bateaux à vapeur sur Copenhague; il est probable que ces bateaux n'avaient pas d'organisation spéciale, puisqu'on n'en fait pas mention (1).

D'autre part, M. le Docteur Appia, le savant auteur du *Chirurgien dans l'Ambulance*, rapporte dans ces termes la manière dont se faisait ce service dans l'armée alliée: L'hôpital de Nübel nous a offert une autre expérience intéressante relative aux divers modes de transport des blessés: je veux parler du *transport par eau*. Situé à quelques minutes du golfe dit Nübel-Noer, il lui était facile d'embarquer ses blessés et, en longeant la côte, d'arriver ainsi à Ilembourg après une traversée de trois heures environ. On avait, cela va sans dire, la précaution d'arborer sur le bateau un drapeau blanc, signe indiquant la présence de blessés et qui est toujours respecté par une armée ennemie. Au port de Ilembourg tout était préparé pour recevoir les blessés sur des brancards, et de là les répartir dans les hôpitaux; l'un de ces derniers, dit la *Commandantur danoise*, était situé à deux pas du lieu de débarquement. J'ai vu plusieurs blessés transportés par cette voie; ils s'en étaient fort bien trouvés et en particulier ne se plaignent pas d'avoir souffert du mal de mer. Je ne sais quelles ont été les expériences à cet égard en Crimée, où les voyages sur mer ont été beaucoup plus prolongés et où des vomissements répétés ont pu offrir des inconvénients plus sérieux. Toujours est-il que ce mode de transport offre d'immenses avantages, au point de vue des secousses, beaucoup moindres, imprimées aux membres malades. — Le passage de Nübel à Ilembourg se faisait sur embarcations à voiles, l'hôpital n'ayant pas réussi à se procurer un bateau à vapeur que les Danois n'eussent pas laissé passer, et qui eût été trop lourd pour être transporté de Hambourg à Ilembourg par voie ferrée, ainsi qu'on en avait d'abord eu l'idée (2).

(1) Van de Velde. *Rapport au Comité de Genève sur sa mission auprès de l'armée danoise*. Genève, 1864.

(2) Docteur Appia. *Rapport au comité de Genève sur sa mission au Schleswig*. Genève 1864.



Voilà en raccourci l'histoire des hôpitaux flottants. Ils ne datent réellement que de 1859. La France, et peu de temps après l'Espagne furent les puissances qui les adoptèrent les premières, l'une en Italie, l'autre en Maroc. Depuis lors il n'y a pas eu d'autres bateaux-hôpitaux vraiment dignes de ce nom que ceux que les États-Unis et l'Espagne ont lancés dans les eaux du Nouveau Monde.

On ne doit pas s'étonner si cette institution naissante présente encore les défauts que nous avons été obligé de signaler. Mais il est consolant de savoir qu'aujourd'hui son existence est assurée et que bientôt elle sera admise par toutes les armées. Le génie inventif est chargé d'y apporter tous les perfectionnements dont elle est susceptible. Cette institution satisfait les cœurs généreux qui reconnaissent le droit aux secours qu'ont les malheureuses victimes des guerres, qui sont nos concitoyens devant la patrie, nos frères devant Dieu !

**Hôpitaux flottants. — Partie technique.**

**I. — Ponton hôpital.**

Nous réservons le nom d'*hôpitaux flottants*, ou *bateaux-hôpitaux* aux bâtiments qui, dûment préparés, naviguent et transportent les blessés ou les malades d'un lieu à un autre. Les navires qui restent dans un port ont reçu la dénomination spéciale de *pontons*. Nous ne ferons que mentionner, attendu que les premiers peuvent remplir dans une guerre extérieure les conditions sanitaires et stratégiques dont nous avons fait ressortir l'importance.

Le meilleur des hôpitaux du genre est sans le *Dreadnought*, beau vaisseau-hôpital établi sur la Tamise devant Greenwich. Selon M. le docteur Marquès (1), il y a bien des villes riches et populeuses qui se contenteraient d'en avoir un pareil pour leur premier hôpital. Il paraît qu'à Londres, si riche en établissements hospitaliers, il n'a d'autre but que de mettre au jour l'amour que sentent les Anglais pour l'élément auquel ils doivent leur grandeur et leur puissance. Cet hôpital flottant, placé près des docks et de milliers de bateaux de toutes les nations, est défrayé par une corporation privée, la *Seamens hospital Society*, qui reçoit à toute heure les marins qui demandent ses secours, et après leur guérison, elle les entretient jusqu'à ce qu'ils aient trouvé un nouvel engagement.

Nous avons quelques pontons-hôpitaux dans la péninsule et les colonies, mais leur utilité n'est évidente que dans les cas où l'on ne pourrait trouver un hôpital fixe à peu de distance. A ce point de vue ils peuvent

(1) *Resultats d'uma comissão medecia militar em Inglaterra.* — Lisboa, 1859.



être d'un grand secours dans les stations navales qu'on doit faire dans les parages peu civilisés, ou quand les conditions hygiéniques de la localité à terre seraient telles qu'ils faudrait soustraire les malades à leur influence. M. Perier (1) rappelle que dans quelques rades l'air est très-salubre à une certaine distance de la plage, quand même celle-ci serait infectée par une endémie. C'est ainsi qu'en Hollande les garnisons françaises eurent à souffrir beaucoup plus que la flotte, ce qui fit naître l'idée de caserner les soldats dans les navires pendant la mauvaise saison. Keraudren dit que dans les Antilles les malades guérissent plutôt à bord que dans les hôpitaux, et Lind vante les avantages de vaisseaux qui servent d'hôpitaux et de factoreries flottantes aux Anglais dans quelques parages de la mer des Indes. Cette double fonction est également remplie par le ponton que nous avons dans l'île Jemando Povi. La frégate *Perla* y sert d'hôpital pour les malades, et de *sanatoria* pour ceux qui ont besoin d'échapper à l'influence paludéenne.

On sait que quand il faut établir un ponton, on choisit d'ordinaire un des vaisseaux les moins aptes pour la navigation, qu'on enferme de toutes ses ancres dans un lieu abrité du vent, pour diminuer son roulis, on démonte ses mâts et on le couvre avec une toiture en planches. De la sorte on peut avoir une bonne salle d'hôpital sur le pont et une autre à l'entrepont, dans lesquelles on devra réunir les dispositions analogues à celles que nous allons recommander pour les hôpitaux flottants de transport.

## II. — *Règles pour la formation d'une escadrille sanitaire.*

### *Nombre des bateaux.*

Le nombre des bateaux à affecter au service sanitaire d'une armée qui va opérer loin de sa patrie doit être proportionné au nombre probable des pertes qu'on aura à supporter ; ces pertes peuvent être calculées d'avance, à l'aide des données statistiques que possède la médecine militaire, en tenant compte des conditions de salubrité dans lesquelles se trouvera l'armée, de l'époque de l'année, du climat du pays, de l'espèce de guerre qu'on va faire, de l'armement et des moyens de destruction dont l'ennemi dispose.

Les pertes d'une armée en campagne occasionnées par les maladies sont évaluées au dixième de l'effectif par M. Vaidy et à un seizième par le docteur Bertherand ; on peut donc connaître chaque jour le nombre des entrées à l'hôpital, en divisant la perte totale par vingt, qui est le nombre des journées de traitement qu'on peut assigner en moyenne à chaque malade, de sorte que chaque jour il entrera à l'hôpital  $1/2$  pour 100 de

(1) *Acclimatement en Algérie.*



l'effectif; si l'armée compte 100,000 hommes, elle en aura 10,000 à l'hôpital, et chaque jour il y entrera 500 hommes. Dans l'armée espagnole du Maroc, nous avons surpassé cette estimation au mois de décembre, attendu qu'il y avait 150 entrées par jour, qui, comparées à l'effectif de 25,000 hommes, représentent une proportion de 1 pour 166 sans compter les blessés; mais il faut attribuer cet excédant à la croissance de l'épidémie cholérique. A l'estimation du nombre journalier de malades il faut ajouter celle des blessés, qu'on pourra faire d'après les conditions de la guerre. En dernier lieu, il faut faire entrer en ligne de compte la longueur de la traversée que ces bateaux auront à faire, puisque si elle est courte, comme entre l'Espagne et le Maroc, on pourra faire le service avec moins de bateaux que quand elle est longue, comme celle de Crimée en France.

Il conviendra beaucoup de diminuer la traversée autant que possible en faisant établir des hôpitaux fixes, soit dans une colonie, soit dans les domaines d'une puissance neutre ou amie, quand l'éloignement de la mère-patrie serait grand; nous croyons, d'après notre expérience, qu'il convient d'abrèger la permanence dans ces hôpitaux et que la traversée ne doit pas excéder, règle générale, deux ou trois jours de navigation.

Après avoir fait le calcul du nombre des bateaux qui doivent former l'escadrille sanitaire avec assez de vastitude pour que dans toutes les circonstances ils puissent suffire au transport de tous les malades et blessés, sans avoir recours à des bateaux dépourvus des conditions hospitalières, il serait bon de les classer en désignant tels bateaux pour les malades, tels autres pour les blessés et d'autres pour les affections contagieuses ou présumées telles; on pourrait bien confondre les deux premières catégories, mais la troisième doit rester distincte.

### III. — *Election du bateau.*

Doit-on prendre des bateaux à vapeur ou à voiles pour en faire des hôpitaux? Les médecins de la marine préfèrent les bateaux à voiles, comme étant plus salubres. M. le Dr Fonsagrives, après avoir fait une étude comparative de ces deux sortes de vaisseaux, a trouvé une plus grande mortalité sur les bateaux à vapeur, et, de plus, une fâcheuse prédisposition pour les influences épidémiques: il attribue ces désavantages à l'espace plus restreint qui dans ces bateaux est affecté à l'équipage, au travail plus fort de celui-ci, aux émanations continuelles du charbon de terre, à la chaleur de la machine, qui détermine de brusques transitions de température, et au dégagement de l'hydrogène sulfuré produit de la décomposition putride



des eaux de la cale, mélangées avec les matières grasses qui sortent de la machine et avec les cendres pyriteuses.

Voilà pour l'insalubrité; il faut aussi tenir compte des désagréments et de l'odeur nauséabonde du coke, du bruit et de la trépidation du vaisseau; si l'on ajoute à tous ces inconvénients la perte de l'espace qu'occupe la machine, qui remplit un tiers de la capacité du bateau, il semble qu'on doive préférer les navires à voiles pour l'installation de l'hôpital, mais des considérations d'un ordre supérieur conseillent de passer sur ces désavantages et de donner la préférence aux bateaux à vapeur.

La première condition d'un bateau-hôpital doit être celle de la rapidité dans le transport des blessés, et cette rapidité, indépendante des accidents atmosphériques, se trouve seulement dans l'emploi de la vapeur. On pourrait encore établir l'hôpital dans un navire qui serait remorqué par un bateau à vapeur, mais le risque qu'il court d'être abandonné en pleine mer alors que le temps est mauvais, et le désagrément de naviguer dans les eaux tumultueuses qui forment l'estèle du remorqueur, ne permettent pas de recourir à ce moyen.

On peut aussi rabattre un peu des causes d'insalubrité énumérées par M. le docteur Fonsagrives; les deux premières dépendent de l'équipage même, et les effets pernicioeux des autres ne peuvent se faire sentir qu'après une longue navigation, et non dans le peu de jours que les blessés doivent rester à l'hôpital-transport. On peut donc, en toute assurance, se décider à n'employer pour ce service que des bateaux à vapeur.

Le Dr Suarez trouve que les *roues* sont préférables à l'*hélice* pour la propulsion de cette sorte de bateaux : quoique dans ceux à *hélice* on trouve une plus grande capacité dans l'entrepont pour loger des malades, la trépidation y est trop brusque, et les amputés et fracturés se trouvent mieux du mouvement égal des roues latérales. J'ai fait cette même remarque quand j'ai transporté des blessés dans le bateau à aubes *le Cid*, et quoique ce ne soit pas une condition capitale, et que l'*hélice* possède de grands avantages pour la navigation, il sera bon de connaître cette circonstance pour le cas où l'on aurait à choisir entre ces deux espèces de bateaux.

Quant à la capacité du bateau, on sera naturellement porté à prendre le plus grand, afin de diminuer les frais d'administration et le personnel d'assistance; mais je trouve qu'on doit préférer résolument les bateaux de moyenne ou de petite dimension. Un hôpital ne doit pas avoir plus de mille tonnes (jaugeage total); de la sorte, on évite le risque de l'encombrement des malades dans ces lieux où, plus que dans tout autre, est à craindre la propagation des fléaux de la pyohémie et du typhus. Le bateau pourra être plus tôt chargé et ne pas faire attendre sa sortie aux pauvres blessés, impatients de se voir chez eux. Enfin, le vaisseau pourra aborder de plus près



au débarcadère du port, sans être obligé à jeter l'ancre au loin et sans faire subir aux blessés les désagréments d'un transbordement sur un autre bateau plus petit qui puisse les porter à terre, comme j'ai dû le faire au port de Cadix avec mon bateau-hôpital *le Barcelona*.

Les statistiques d'hygiène navale viennent à l'appui de cette opinion, puisqu'on a observé dans les escadres françaises de la Méditerranée que la salubrité des navires se trouve en rapport inverse de leurs dimensions, et que, sous ce point de vue, les frégates sont préférables aux vaisseaux à trois ponts.

Après avoir esquissé les règles qui doivent nous diriger dans le choix des bateaux qui doivent composer l'escadrille sanitaire, voyons comment on pourra les approprier aux usages hospitaliers.

#### IV. — *Distribution et arrangement du bateau-hôpital.*

Dans mon opinion, on ne doit loger les malades que dans les cabines de poupe et proue et dans le premier entrepont ; vouloir en placer dans les soutes ou entreponts inférieurs, c'est leur faire courir de graves risques par le défaut de ventilation, et se procurer bien des difficultés pour l'entrée et la sortie des malades. L'espace mentionné suffit dans un bateau-transport pour le logement commode de 200 hommes et nous avons déjà dit qu'il est très-convenable de ne pas excéder ce chiffre.

On commencera par débarrasser les cabines de l'entrepont des objets qui pourraient s'y trouver, de l'artillerie si c'est un bateau de guerre, et des cloisons en bois dans les navires marchands : on blanchira les parois à la chaux et on fera des fumigations si on l'estime nécessaire. Nous aurons donc deux grandes salles, l'une du côté de la poupe, l'autre de la proue, pour y placer les lits.

Dans nos bateaux-hôpitaux au Maroc, on avait bien profité de ces espaces, quoique en sacrifiant un peu les règles de l'hygiène : les lits étaient superposés en deux rangs. Cette disposition est très-génante pour le médecin, qui doit se mettre à genoux pour panser les blessés du rang inférieur, et à besoin de monter sur un meuble quand il veut soigner ceux qui sont au rang supérieur. Elle pourrait devenir assez désagréable pour les malades eux-mêmes, quand il se trouverait parmi ceux qui sont au-dessus des individus pris de vomissements ou d'hémorragies.

Le docteur Fonsagrives blâme aussi dans les vaisseaux marchands « ces cabines pleines de litières superposées, dont l'insalubrité se décèle par sa puanteur, et où au manque d'espace s'ajoutent tous les inconvénients d'une délétère promiscuité. » Seul, le besoin impérieux de placer beaucoup d'hommes dans un lieu restreint peut faire tolérer cette dispo-



sition, qu'on trouve malheureusement même dans les plus luxueux bateaux de transport, et si nous l'admettons pour nos hôpitaux flottants dans des circonstances urgentes, il faut qu'en règle générale on n'y place qu'un seul rang de lits, comme on le fit dans ceux d'Italie et de Saint-Domingue.

Quand on le peut, il est bon de placer les lits dans le sens de la longueur du bateau, sinon les malades ont à sentir plus vivement le mouvement du roulis qui élève alternativement leurs pieds et leur tête. Quoique ce détail n'ait pas une importance capitale, on doit y faire attention, puisque la plupart des passagers ne sont pas habitués à la mer.

*Lits.* — Dans nos hôpitaux flottants au Maroc, les lits étaient fixes et formés de deux planches horizontales et de quatre planches verticales clouées aux poutres verticales et constituant une caisse semblable à celles qu'on voit dans les cabines des passagers. Les lits en fer vissés au plancher par les pieds sont plus commodes. On en meubla les bateaux-hôpitaux français en Italie et les bateaux-hôpitaux espagnols à Saint-Domingue : on évite ainsi la fâcheuse promiscuité des lits superposés, on facilite le service, et on donne à tous les malades un égale volume d'air et de lumière. Cette disposition est donc celle qu'on doit préférer dans l'arrangement d'un hôpital flottant.

J'avais eu l'intention de substituer à ces lits des hamacs ou *cadres* d'une forme spéciale qui pourraient être suspendus par des anneaux, comme on a fait plus tard dans les wagons-hôpitaux des Etats-Unis. Je voulais par cette disposition remédier d'une part à l'insalubrité des lits fixes, et amoindrir d'autre part les souffrances et les incommodités causées au blessé par les translations qu'il doit subir : 1° du brancard qui l'a recueilli au camp au brancard du bateau ; 2° de ce brancard au lit ; 3° du lit au brancard marin, et 4° de celui-ci à celui de l'hôpital fixe. Cette série de translations, toujours difficiles à bord par le manque d'espace et de brancards, toujours douloureuse pour les fracturés, nous voulions l'éviter en faisant que le même brancard qui accueillait le blessé sur la plage aurait pu servir pour le hisser à bord et lui tenir lieu de lit jusqu'à son arrivée dans un hôpital fixe.

Mais en réfléchissant au pour et au contre d'un pareil système, j'ai acquis la conviction qu'on ne peut le généraliser : parce qu'en échange d'un avantage positif mais transitoire, on imposerait au soldat les désagréments d'un lit dur et étroit pendant toute la durée de la navigation : il vaut mieux qu'il soit quelque peu cahoté à l'entrée et à la sortie, pourvu qu'il trouve pour la traversée un lit solide, commode, large et douillet, conditions que mon brancard-hamac ne pouvait réunir.

On peut aussi prévenir les désagréments du transbordement, en déposant



le brancard de chaque blessé grave sur les matelas de son lit, de sorte qu'il ne le quitte pas. Comme le nombre de ceux qui ne peuvent marcher ne sera que d'un cinquième tout au plus de l'effectif des évacués, il ne doit pas être difficile de trouver assez de brancards pour permettre cette disposition.

Il faut compter que ces brancards doivent avoir été construits dans les dimensions convenables afin qu'ils puissent passer à travers les écoutilles du vaisseau, et qu'ils doivent être pourvus d'anneaux à chaque extrémité de leurs deux lances, afin qu'on puisse les agraffer par les câbles de la grue, qui doit les hisser ou les déposer.

On doit placer les lits dans les salles de l'entre-pont, en profitant du terrain autant que possible, mais en laissant entre chaque rang un passage auquel chaque lit doit correspondre par un de ses côtés longitudinaux.

Les salles seront destinées aux malades et blessés de la troupe; les chefs et les officiers seront placés dans les cabines du pont, qu'on aura préparés à cette fin.

*Salle d'opérations.* — En supposant que la traversée de ces bateaux soit courte, il n'y aura pas beaucoup de grandes opérations chirurgicales à faire, et en général il suffira d'extraire les projectiles, régulariser les blessures, faire quelques ligatures, etc. Mais il peut cependant se présenter une indication urgente d'amputation, de trépan ou quelque autre opération grave, soit que l'hôpital doive rester en rade en attendant que son chargement soit complet, comme il advint au mien après le combat du Montenegro, soit que les blessés y arrivent directement du champ de bataille et sans aucun pansement, comme je l'ai vu à la bataille de Castillejos. Il faut prévoir cette éventualité, afin de ne pas affliger les blessés par le navrant spectacle d'une opération sanglante, et de mettre l'opéré dans les meilleures conditions possibles, et pour cela il faut désigner une cabine sur le pont comme salle d'opérations et la pourvoir d'un bon lit solide et accessible de tous les côtés.

*Pharmacie.* — Une autre cabine de celles qui se trouvent sur le pont servira de laboratoire pharmaceutique pour le dépôt et la préparation de tous les médicaments nécessaires au service des malades. On doit placer au milieu une table solide et avec des creux pour éviter la chute des vases.

L'approvisionnement de médicaments et d'effets de pansement doit être en rapport avec la classe des malades ou blessés à laquelle on a destiné le vaisseau. Les flacons de médicaments doivent se trouver assujettis afin de ne pas tomber dans le roulis du vaisseau : on aura des ustensiles pour les préparations officinales les plus usuelles. Dans les hôpitaux pour les blessés, l'arsenal pharmaceutique peut être réduit aux objets de pansement, appareils de fractures, appareils d'hyponarthécie, d'irrigation continue, etc. On aura aussi une machine à fabriquer la glace, de bonnes boîtes d'amputation, trépan, etc.



V. — *Ventilation.*

Les batteries ou les entre-ponts du vaisseau étant ainsi disposés pour la réception des malades, il faut leur assurer leur volume d'air pur dans les salles où l'atmosphère sera bientôt vicié par l'encombrement et par toute sorte d'émanations malsaines. La moindre négligence dans une affaire aussi importante pourrait entraîner les plus désastreuses conséquences dans ces bateaux où les yeux du médecin voient toujours suspendue comme une épée de Damoclès la menace du typhus et de la pourriture d'hôpital.

L'appareil de ventilation le plus simple, celui qu'on trouve dans tous les bateaux, et presque le seul qu'on y trouve, c'est la *manche à vent*, qui consiste dans un tuyau en toile dont l'orifice supérieur élargi par un cerceau est placé dans la direction du vent, et dont l'orifice inférieur plonge dans la salle qu'on veut ventiler en passant à travers les écoutilles.

Ce système, assez primitif, a l'inconvénient de ne pouvoir être employé que par le beau temps, puisque, s'il pleut, il faut fermer l'écouille, et ne pas faire entrer l'eau dans l'infirmerie à travers le tuyau de la manche. Quand le vent est trop fort, cet appareil reste inutile parce que sa toile ployée contre le bord de l'écouille interrompt la circulation. On voit donc qu'avec ce système la rénovation de l'air n'est nullement assurée, et qu'il faut avoir recours aux véritables appareils de ventilation pour les navires qui ont été proposés par Desagulier, Duhamel, Poiseuille, Sutton, Fonssagrives, Hale, Arnott et autres. N'ayant pas eu l'occasion d'étudier le fonctionnement de ces appareils, je dois m'abstenir de toute préférence, mais je crois que s'il fallait en improviser un pour bateau-hôpital, on pourrait le faire en établissant dans chaque salle de l'entrepont deux tuyaux de poêle, dont l'un destiné à l'expiration de l'air vicié passerait par la cuisine ou la machine afin de profiter de sa chaleur pour établir le tirage comme l'a conseillé le docteur Sutton, et l'autre destiné à l'aspiration de l'air pur s'ouvrirait à l'extérieur dans une extrémité du bateau : ces tuyaux devraient être pourvus d'une tête giratoire à leur extrémité extérieure afin de diriger sa bouche vers ou contre le vent, et de valvules pour arrêter la circulation.

VI. — *Vivres.*

Il ne suffit pas d'approvisionner l'hôpital avec la même espèce de vivres qu'on administre au soldat en campagne : ni les conserves, ni les viandes salées ne conviennent à la faiblesse organique des blessés et des malades, qui, d'autre part, regretteraient de trouver à l'hôpital l'alimentation monotone



dont ils sont dégoutés au camp. Il faut donc s'assurer la fourniture d'aliments frais et avoir à sa disposition quelques mets plus délicats que ceux qui composent l'ordinaire. On doit porter de la farine et des appareils qui permettent la panification quotidienne ; on doit embarquer des poules et des moutons qu'on tuera à l'occasion pour fournir de la viande fraîche ; on tâchera aussi de prendre des légumes frais, en sus des légumes desséchés par le système de M. Masson ; on aura une cave bien garnie, et le lait solidifié, l'extrait de viande de Liebig, ainsi que le jus de citron et les fruits confits permettront de satisfaire les indications exigées par la faiblesse des hôtes de l'hôpital flottant.

L'approvisionnement de l'eau est d'une importance encore plus grande ; il faut qu'elle soit de la meilleure qualité, et on doit la conserver dans des caisses en fer qui, jusqu'à présent, sont celles qui allèrent le moins ses conditions. Et pour que jamais ne puisse manquer ce précieux liquide, chaque bateau sera pourvu d'un bon appareil distillateur qui, dans un cas extrême, permette d'utiliser celle de la mer ; la science a démontré déjà que l'eau qu'on obtient par ce moyen n'est pas nuisible, puisque la quantité de sel qu'elle retient toujours n'est pas supérieure à celle qu'on trouve dans les eaux potables de la plupart de nos fontaines.

#### VII. — *Canots et bateaux plats.*

Comme dernier détail de l'aménagement du matériel dont on a besoin pour faire fonctionner un bateau-hôpital, il nous reste à dire quelques mots des moyens de faciliter l'embarquement et le débarquement des malades. Il ne faut pas compter pour cela sur les canots du bateau, parce que leurs petites dimensions rendraient interminable le transport de tant de monde. Nous avons fait observer que jusqu'ici c'étaient les administrations maritimes des ports qui fournissaient à ce besoin avec des bateaux plats ; ceux des Français, à Gênes, étaient capables de contenir 300 à 400 hommes ; les nôtres, au Maroc, ne pouvaient en contenir que cent, et dans les plages inhabitées, tous les vaisseaux de l'escadre nous envoyaient leurs canots pour embarquer les blessés aux hôpitaux flottants. Quelquefois, dans les rivières navigables, comme le Guad al Jelù, c'étaient de petits yachts à vapeur qui conduisaient les malades ou blessés jusqu'au bateau-hôpital qui se trouvait dans la baie.

Il est à désirer que l'hôpital puisse se suffire à lui-même dans toutes les circonstances, et pour cela il conviendrait de lui ajouter deux de ces gabares, espèces de radeaux avec balustrade en bois, que le bateau pourrait emporter toujours à sa remorque.



Pour en finir avec le matériel, nous ne ferons que rappeler le besoin d'installer dans l'hôpital une lingerie bien pourvue, d'avoir de la vaisselle en quantité suffisante, des fanaux pour l'éclairage des salles, et de ne pas oublier l'arrangement convenable des lieux d'aisances.

#### VIII. — *Personnel.*

Quatre services doivent fonctionner ensemble dans un hôpital flottant : le service maritime, le service sanitaire, le service administratif et le service religieux, et chacun d'eux a besoin d'un personnel spécial.

Le personnel de la marine sera dans ces bateaux le même que portent ceux de la même capacité qui sont destinés au service des messageries ou des postes ; on pourrait peut être réduire l'équipage au strict nécessaire pour la manœuvre, mais quelquefois les hommes doivent aider au service hospitalier pour hisser les brancards à bord ou les faire sortir.

Le personnel sanitaire doit compter un médecin-chef et deux aides-majors, afin que chacun d'eux n'ait pas à sa charge plus de soixante-dix malades ou blessés ; chaque médecin sera assisté de deux élèves et des soldats infirmiers nécessaires, en supputant un infirmier pour douze lits.

Le service administratif sera à la charge d'un officier-comptable, un officier-adjutant avec les commis et les garçons nécessaires pour les magasins, la cuisine, etc.

Le service religieux est indispensable de ces hôpitaux, où presque toujours trépassent quelques malheureux pendant la traversée. Un seul aumônier pourra suffire dans chaque bateau, pour adoucir avec les sublimes consolations de la religion les derniers moments des martyrs de la patrie.

Ces quatre services ont assez d'indépendance entre eux pour que chacun puisse fonctionner dans son cercle sans envahir celui d'autrui ; mais si par hasard survient quelque conflit d'attributions, on doit le résoudre ayant en vue que le service sanitaire, suivant les besoins auxquels il répond, a droit au premier rang dans ces navires, comme le déclarait le Directoire de la République française dans les ordonnances que nous avons citées, et comme, par ordre royal, on le fit savoir en Espagne, à l'occasion de la guerre du Maroc.

#### IX. — *Organisation du service aux hôpitaux flottants.*

Après avoir exposé tout ce qui a rapport au matériel et au personnel d'un bateau-hôpital, nous finirons cet opuscule en décrivant sa manière de fonctionner quand il doit remplir le service auquel on l'a destiné. Nous n'avons



pas pour cela la prétention de formuler le règlement des hôpitaux flottants, ni de donner des leçons aux chefs de chaque service, qui sauront trouver dans leur expérience les meilleurs moyens pour vaincre toutes les difficultés imprévues qui pourraient surgir : nous voulons seulement prendre note du peu que nous a appris l'expérience aux eaux d'Afrique et faire, avec la description du fonctionnement d'un de ces bateaux, la meilleure démonstration de son utilité et de ses avantages.

Supposons réunis dans la plage tous les blessés qui sont tombés dans un combat, soit que le camp se trouve à proximité de la mer, soit que les blessés aient été conduits dans des fourgons et voitures, cacolets ou brancards, ou dans des bateaux, s'il y a une rivière navigable. Notre vaisseau-hôpital a déjà envoyé à terre une de ses grandes gabares, et en y prenant tous les blessés capables de marcher, on s'informe du nombre des invalides, et on le signale au vaisseau, lequel envoie alors sa deuxième gabare, pourvue du nombre nécessaire de brancards ou litières. Dans chacune de ces gabares il y a quatre infirmiers pour placer convenablement les blessés, et un élève avec les moyens nécessaires pour parer à tout accident urgent, tel que la chute d'un pansement, une hémorrhagie, etc. L'officier adjudant du comptable s'y trouve aussi pour prendre note du nombre de blessés qu'on reçoit et avoir soin qu'il ne soit pas supérieur au nombre des lits du bateau.

Pendant ce temps, on fait ses préparatifs à l'hôpital : on assortit dans la pharmacie les appareils portatifs de pansement ; on ouvre le grand portail de proue, on y établit la cabre ou cabestan desservi par les matelots. A ce portail et au haut de l'échelle se place un médecin assisté de quatre infirmiers, tandis que l'élève et le reste des infirmiers prennent leur poste à l'entrée des salles, et les commis aux subsistances font préparer le bouillon et les aliments qu'ils croient nécessaires.

La gabare qui emporte les blessés moins graves aborde à l'échelle du bateau ; les hommes montent l'un après l'autre, ils livrent leur fusil et vont, conduits par un infirmier, prendre place dans les lits les plus séparés de l'écouille d'entrée ; ils se déshabillent et se couchent sans bruit ni confusion.

La gabare aux blessés graves et aux fractures aborde sur le portail de proue, et là on hisse les blessés sur leurs brancards au moyen de la cabre ou cabestan qui les dépose au fond de l'entrepont en passant par l'écouille ; les infirmiers s'en emparent, détachent le brancard des crocs du câble et les placent dans les lits, toujours en commençant par le plus éloigné de la porte. Les médecins surveillent cette opération, les infirmiers conduisent les blessés et les élèves regardent s'il y a quelque indication urgente à remplir.

Cette entrée des blessés à bord donne lieu à une confusion énorme, si



on ne veille à ce qu'elle se fasse dans l'ordre et le silence le plus absolu ; si on la dirige bien, elle est bientôt finie, et quand chaque blessé se trouve casé dans son lit, les médecins commencent la visite. C'est le médecin en chef qui se charge de celle des officiers et les aides-major des salles des soldats. Un des deux élèves attachés à chaque médecin consigne dans son livret, sous le numéro du lit, la classification de la blessure et les médicaments ordonnés ; l'autre enregistre l'alimentation signalée à chaque malade. L'adjudant comptable accompagne la première visite du médecin en prenant note du nom et de la procédence des blessés, et si quelqu'un d'eux n'est pas en état de répondre, on prend toutes les indications fournies par son uniforme et ses papiers ; il est très important de ne pas négliger ce soin afin de pouvoir répondre plus tard aux réclamations des familles. M. l'aumônier peut commencer en même temps à s'enquérir de ceux qui ont besoin de son auguste ministère.

Les médecins continuent sans interruption leur tâche pénible ; ils calment l'anxiété des blessés par un rapide examen général et reprennent la visite en commençant par les plus graves, en exécutant toutes les opérations et pansements nécessaires. En même temps, on distribue le bouillon ou les aliments convenables.

Le bateau a chauffé sa machine, il est appareillé et, quand l'ordre de départ arrive de l'état-major général, on commence à lever les ancres. C'est alors que le médecin en chef, avec connaissance de l'état des blessés, de la durée et des accidents probables de la traversée, décide si le service se fera par quartiers ou si tous les employés de l'hôpital doivent rester en faction permanente.

Quand le vaisseau arrive au port de sa destination, il est admis tout de suite à la libre pratique, et pendant que les blessés valides s'habillent pour sortir, un des officiers-médecins se rend à terre pour faire part de l'arrivée de l'hôpital à l'autorité militaire du lieu, à laquelle il doit présenter un état du nombre d'hommes qui arrivent, avec classification de leurs blessures par régions et par gravité, et demander les secours dont on aura besoin pour opérer le débarquement. Ces secours consistent en chaloupes et en brancards, et j'ai vu mainte fois, à Cadix et à Malaga, qu'il était difficile de se procurer le nombre de ces appareils dont on avait besoin pour opérer en une seule fois le transport des blessés. Si, comme nous l'avons recommandé, chaque blessé grave a son brancard à lui dans le bateau, et si l'on porte des gabares, il n'y aura qu'à demander le nombre de soldats nécessaire pour porter les brancards du port à l'hôpital de la ville.

Le débarquement doit se faire avec le même ordre que l'embarquement : les blessés valides descendent par l'échelle, pendant que les blessés graves sont déposés dans la gabare, au moyen de la cabre, par le portail de proue ;



les infirmiers aident les blessés et les médecins surveillent. Quand tout le convoi de blessés ou malades se trouvera réuni sur le quai, les uns appuyés sur leur canne, les autres au bras d'un camarade et les invalides portés sur des brancards, il se rendra, sous la conduite d'un médecin assisté de ses élèves, à l'hôpital ou aux hôpitaux qu'on aura désignés pour sa réception. Le médecin conducteur doit faire au médecin de l'hôpital qui le reçoit toutes les observations qu'il jugera convenables sur la situation des blessés graves. L'officier comptable doit suivre le convoi avec ses aides pour reprendre les brancards du bateau et pour livrer les armes et les effets des blessés à qui de droit.

Une fois l'hôpital flottant évacué, il faut s'empresse de faire blanchir tout le linge des lits, laver soigneusement l'entrepont, nettoyer tous les objets employés pour les malades et faire des fumigations si le médecin en chef le croit convenable; de la sorte, le bateau se trouvera en condition de pouvoir reprendre ses fonctions dans le plus bref délai.

#### Trains-Hôpitaux.

##### I. — Application sanitaire des chemins de fer. — Guerre d'Italie.

Personne ne peut méconnaître la profonde et radicale modification qui a été imposée à l'art de la guerre, par le développement des voies ferrées, dont les mailles se rétrécissent chaque jour, enveloppant le sol de l'Europe et de l'Amérique. Ce puissant agent de civilisation, qui, avec le télégraphe électrique, sera le blason glorieux de notre siècle, aide beaucoup à l'œuvre de destruction mutuelle qu'entreprennent deux peuples quand ils se déclarent la guerre. Grâce aux voies ferrées, les batailles inopinées ou de *rencontre* sont bien plus fréquentes (1); elles contribuent aussi à l'augmentation du nombre des combattants, en permettant la concentration rapide des forces et du matériel, et conséquemment le carnage est plus fréquent, plus grande la destruction, plus nombreuses ses victimes; mais, d'autre part, nous pouvons aussi, grâce aux voies ferrées, concentrer sur le champ de bataille toutes les ressources sanitaires, et nous pouvons aussi, avec ses ailes, enlever du théâtre du combat des milliers de victimes, qui sans cela devraient y rester en proie aux poignantes douleurs de l'abandon. Tant il est vrai que la bonté ou la méchanceté des agents matériels dépend de l'usage que nous en faisons! Tant il est vrai que la civilisation, comme le javelot d'Achille, sait toujours guérir les blessures qu'elle fait!

(1) *Táctica de Infantería*, par M. le maréchal marquis del Duero. Madrid, 1864.



L'application des wagons du chemin de fer pour le transport hospitalier est encore plus moderne que celle des bateaux à vapeur : son histoire ne sera pas longue ; il suffira de démontrer l'importance de cette application et l'immense bienfait qu'elle constitue pour la santé des armées.

C'est dans la campagne d'Italie qu'on eut la première occasion d'utiliser les voies ferrées pour l'évacuation des blessés, et on le fit en même temps d'un côté et de l'autre. Après la grande bataille de Solferino, l'armée autrichienne réussit à passer le Mincio en sauvant son matériel et un grand nombre de ses blessés, par la construction rapide de ponts volants. Pendant toute cette nuit si triste, l'affluence des blessés fut énorme à Villafranca : les médecins pansaient leurs plaies, les réconfortaient par quelques aliments et les expédiaient, par les wagons du chemin de fer, sur Vérone, où l'encombrement devint effroyable. Ainsi parle M. Henry Dunant, le chantre de cette journée homérique, l'éminent philanthrope, dont la généreuse initiative a donné à l'humanité la Convention de Genève.

La réparation du chemin de fer de Milan à Venise, coupé par les Autrichiens, permit d'évacuer le dépôt des blessés franco-italiens, improvisé à Brescia. A chaque station, des baraques longues et étroites avaient été construites pour la réception des blessés, qui, à leur sortie des wagons, étaient déposés sur des lits ou sur de simples matelas alignés les uns à la suite des autres ; sous ces hangars sont dressées des tables surchargées de pain, de bouillon, de vin et surtout d'eau, ainsi que de charpie et de bandes, dont le besoin ne cesse pas de se faire sentir... Les citoyens lombards se hâtent d'apporter leur tribut d'égards et de gratitude aux vainqueurs de Solferino... Les dames leur offrent des boissons rafraichissantes (1).

Le docteur Herman Demme, trop tôt enlevé à la science par un événement désastreux, après une carrière courte, mais brillante, s'exprime dans les termes suivants, en étudiant l'influence du mode de transport des blessés sur les blessures.

« La longueur, la lenteur et la difficulté du transport des blessés dans la guerre de Crimée déterminèrent des pertes déplorables, et furent la cause de l'extraordinaire mortalité qu'on y subit. Quoique dans la campagne italienne de 1859 on fut obligé quelquefois d'avoir recours aux charrettes et aux voitures, on employa aussi sur une vaste échelle le transport par voies ferrées ; ce fut un immense bienfait pour les blessés, et cela explique la plus favorable proportion qu'on trouve dans la statistique des hôpitaux italiens. Les conditions topographiques du champ de bataille de Magenta permirent un transport spécialement rapide et favorable. Les blessés de Magliano arrivèrent aussi aux hôpitaux de Milan dans les quarante-huit

(1) Henry Dunant, *Un souvenir de Solferino*. Genève, 1862.



heures, mais on n'obtint pas la même célérité pour ceux du combat de Palestro. A Solferino, l'énorme étendue du champ de bataille, les accidents du terrain et l'éloignement de la voie ferrée étaient autant d'obstacles pour le transport, qui retardèrent pour plusieurs le premier pansement : quelques blessés restèrent des journées entières gisant sans secours sur le champ de bataille ; la plupart étaient entassés dans des abris provisoires, aux villages des alentours. A Castiglione on ne trouvait pas une église, pas une maison, pas une rue qui ne fût remplie de blessés, dont quelques-uns attendaient pendant des journées entières le premier pansement. Aussi, la mortalité fut considérable pendant les premières quarante-huit heures. Cela explique aussi la grande proportion d'inflammations violentes et de complications gangreneuses et érysipélateuses qu'on observa chez un grand nombre des blessés de cette journée transférés à Brescia. Malgré toutes ces circonstances, il faut dire que dans cette bataille la statistique finale a été bien plus favorable que dans la plupart de celles de la guerre de Crimée. Les voies ferrées pour l'évacuation des convalescents, que l'intendance militaire a réalisée avec tant d'ordre et de rapidité, ont été aussi importantes que pour le transport des blessés. Il faut dire aussi que les hôpitaux les plus importants, comme ceux de Turin, Vercelli, Milan, Brescia et Vérone, se trouvaient justement sur le parcours du chemin de fer ou dans ses embranchements, et même les dépôts les plus éloignés, comme Pavie, y avaient un facile accès. Cette célérité dans les transports a rendu réalisable l'excellent conseil du baron Larrey « *ayez du large* » si peu observé jusqu'ici (1). »

## II. — Guerre civile américaine. — Campagne du Schleswig.

Les avantages de l'application des chemins de fer au transport des blessés étaient déjà démontrés, lorsqu'on y a employé le matériel ordinaire du service des voyageurs ; mais aux États-Unis on a fait quelque chose de plus, on a augmenté ces bienfaits par l'adoption d'un matériel spécial, et de la sorte on a réalisé ici le même progrès qu'on obtint quand les bateaux de transport furent convertis en bateaux-hôpitaux.

Depuis le commencement de la guerre d'Amérique, les 60,000 kilomètres de voies ferrées qui sillonnent le territoire de l'Union avaient servi à beaucoup de transports de blessés et malades, qu'on faisait avec tous les désagréments, les chocs, les secousses et l'abandon qui sont inhérents au défaut des conditions spéciales pour ce service. La campagne de 1862 fit ressortir

(1) *Militär-chirurgische studien in den Italianischen Lazarethen*, von Dr Hermann Demme. Würzburg, 1861.



le besoin d'améliorer les conditions du transport des malades par les chemins de fer. Un agent de la Commission sanitaire qui dirigeait un convoi de blessés, après la bataille de Blair-Oaks, dit : « Tandis que j'étais témoin de l'intense agonie de ces pauvres camarades, l'idée me vint qu'on pourrait vaincre par des moyens mécaniques les difficultés que j'avais en vue. Aussitôt je traçai un modèle de wagon, dont la disposition venait résoudre le problème. » Cet homme bienfaisant est le docteur Elisha Harris, célèbre praticien de New-York, est un des plus ardents promoteurs de la puissante commission sanitaire des États-Unis. A lui donc l'honneur d'avoir inventé des wagons-hôpitaux.

Personne ne songea à mettre en doute la convenance de cette réforme : le gouvernement d'un côté et les compagnies de chemins de fer de l'autre lui prêtèrent généreusement leur concours : le département médical de l'armée se chargea de l'organisation des trains-hôpitaux dans l'Est; la commission sanitaire de ceux de l'Ouest, et avec l'activité industrielle qui caractérise l'esprit *yankée*, les wagons-hôpitaux roulèrent bientôt sur toutes les lignes ferrées qui mettaient en communication l'armée avec ses hôpitaux. Chacune de ces *ambulances de chemins de fer*, comme on les appelait, était pourvue de toutes les ressources d'un bon hôpital : les lits offraient sécurité et repos, les voitures étaient chauffées, ventilées et avaient un jour convenable. On trouvait dans chaque train un bon approvisionnement de linge, d'aliments concentrés, de café, thé et médecine, de l'eau, un ingénieux appareil de cuisine, et pour que rien n'y manquât, des tubes élastiques qui portaient d'une extrémité à l'autre les dispositions et la vigilance du médecin chargé du convoi.

Pour donner une idée exacte de la disposition de ces trains, nous ne pouvons mieux faire que de transcrire la description qu'en a donnée le savant Dr Barnum.

Nous avons neuf wagons hôpitaux (*hospital cars*), sept dans le chemin de fer de Chattanooga à la charge de M. le Dr Myers, et les deux autres sous ma direction immédiate au chemin de fer de Louisville.

Le train de Louisville à Chattanooga est composé d'une voiture à voyageurs, une voiture de poste, trois fourgons (*box*) et trois wagons hôpitaux. La voiture à voyageurs est entretenue avec la plus grande propreté, et ne sert qu'aux malades : les sièges que généralement on trouve dans tous les convois de malades, dont plusieurs préfèrent aller assis. »

« Les nouveaux wagons hôpitaux remplissent parfaitement leur but, parce qu'on y trouve toute la liberté possible pour les mouvements, peu de bruit, une bonne ventilation, un degré de chaleur confortable, et facilité pour la charge et décharge. Ces wagons ont été construits sur le modèle de



ceux qui fonctionnent entre Washington et New-York avec de petites modifications que les tunnels et la différence dans la largeur de la voie rendaient nécessaires. Le tampon (*draw bar*), qui réunit les wagons entre eux, est enveloppé d'un fort ressort spiral qui prévient et amortit les chocs brusques. Sous les plates-formes il y a doubles ressorts et une barre à ressort elliptique dans le côté pour empêcher le balancement latéral. Chaque voiture porte 24 brancards-lits suspendus par des bandes de caoutchouc; ils sont pourvus d'un matelas en crin et du linge nécessaire, qu'on change aisément; on peut les faire sortir de la voiture pour prendre les malades et les remettre en place, ainsi que pour les porter à l'hôpital à la fin du voyage. Les bandes de caoutchouc amortissent les secousses et impriment au brancard un mouvement doux qui prédispose le malade au sommeil.

« Il y a place dans les wagons pour ceux qui voudraient s'asseoir, et un sofa pour le médecin, sous lequel on a fait des compartiments pour le linge, les livres, les journaux, etc. En face du sofa on a placé une étuve de six pieds sur trois, où l'on trouve un dépôt d'eau, une aiguière, place pour laver la vaisselle, un compartiment pour placer les assiettes, et deux grandes lampes où chauffent des casseroles qui permettent de faire avec promptitude et propreté la soupe, le thé, le café, etc.

« La locomotive est pourvue d'un appareil qui empêche la communication du bruit qu'on fait pour appliquer ou arrêter le mouvement. L'intérieur des voitures est décoré dans un voile supérieur à celui des voitures à voyageurs qui sont en usage dans le nord-est.

« On trouve toujours dans le train des effets d'habillement pour les donner à ceux qui en auraient besoin; on prête libéralement les ressources sanitaires de toute espèce, et quant à l'alimentation, elle est excellente et bien des fois on ajoute à la ration du Gouvernement quelques délicatesses pour le compte de la commission sanitaire.

« A Bridgeport on fait trois expéditions de malades par semaine. On a transporté aussi un grand nombre de soldats congédiés ou inutiles, mais la plupart de ceux-ci profitaient de la voiture à voyageurs ou des *box cars* du train.

« Depuis que je suis chargé du train-hôpital, j'ai transporté 20,472 malades ou blessés et n'en ai perdu qu'un seul, lequel fut embarqué contre l'opinion de son officier-médecin et contre la mienne, et seulement pour ne pas lui refuser la consolation d'aller mourir chez lui. » (1)

Après avoir démontré, par les études du docteur Demme, combien le transport par voie ferrée diminue la mortalité consecutive des blessés,

(1) *The Sanitary Commission of the U. S. A. Its works and Purposes.* New-York. 1864.



nous pouvons invoquer les avantages que ce mode spécial a procurés aux défenseurs de l'Union américaine. Tous les témoignages sont unanimes pour proclamer l'importance et la perfection de ce moyen de transport. M. le docteur Newberry, dans son rapport sur le département de l'Ouest, le considère comme une *institution indispensable*. M. le docteur Thurston, inspecteur médical de Nashville, n'hésite pas à déclarer que « dans son opinion les *trains-hôpitaux* sont le moyen qui garantit le plus la commodité des malades (1). »

En Espagne, nous n'avons pas eu, heureusement, jusqu'ici, l'occasion d'utiliser les chemins de fer pour le transport des blessés de guerre, et on ne l'a essayé que dans des cas isolés. Ainsi, en 1859, mon excellent ami, le docteur L. de Somovilla, eut à transférer d'Aranjuez à Madrid un officier des hussards, souffrant d'une luxation et d'une fracture du pied. Il fit placer le brancard dans un fourgon et le fit suspendre avec des cordes aux quatre angles du toit, pendant que quatre hommes empêchaient de la main tout mouvement d'oscillation (2). Je profitai de la même disposition, avec un égal succès, quand en 1860 j'eus à transporter, du camp de Torrejon à Madrid, un capitaine des cuirassiers blessé à la tête par deux balles de revolver.

### III. — Arrangement des wagons-hôpitaux; composition des trains.

Il est difficile d'organiser, avec le matériel ordinaire des chemins de fer, un train-hôpital convenable pour l'évacuation des blessés. Les voitures des voyageurs ne peuvent être utilisées que pour les convalescents ou pour ceux qui sont légèrement blessés.

Ceux qui sont gravement malades ou blessés, tous ceux, en un mot, qui ne peuvent marcher, ne sauraient être placés que dans les fourgons des bagages ou dans les wagons d'écuries garnis de paille ou de foin; ils seraient couchés les uns à côté des autres dans la largeur du wagon; de la sorte, huit hommes seraient casés sur chaque rang, et il resterait au milieu un passage libre où pourrait circuler l'infirmier.

Il convient donc, autant dans l'intérêt de l'humanité que dans l'intérêt d'une sage économie, d'avoir des wagons spéciaux disposés en hôpitaux. La disposition des wagons indiquée par le docteur Harris ne laisse rien à désirer. Toutefois, les salons à trente-deux lits ne sauraient être installés que dans les voitures américaines (*cars*), ou dans les voitures également longues qui circulent sur quelques chemins de fer en Suisse ou dans des

(1) *Sanitary Reporter*, vol. I, n° 1.

(2) *Memorial de sanidad del Ejército*. Madrid, 1859.



Etats d'Allemagne, mais dans la plupart des pays d'Europe, où existe la séparation des voyageurs en trois classes, les voitures n'ont que quatre roues. On y entre par les deux côtés et non par le fond, comme dans les *cars*, et, par conséquent, on ne peut arranger les lits des deux côtés avec une ruelle centrale, comme dans le modèle américain.

Les wagons de troisième classe et les wagons écuries, plus nombreux et plus solides, sont ceux qui peuvent le mieux être adaptés pour le transport des blessés. Pour les wagons écuries, il faudrait ajouter à la plate-forme des ressorts de suspension, puisqu'ils ne sont munis que de ressorts de choc et de traction. Dans ces voitures on peut placer deux lits de chaque côté de la porte et un lit dans chaque fond, et en superposant trois rangs de lits, comme on fait dans le modèle américain, chaque voiture pourrait contenir dix huit blessés. Ces lits ne devraient pas être fixes, mais des brancards qu'on suspendrait par des anneaux, des crocs fixés aux parois et aux six piliers en fer ou en bois dressés dans le wagon. Une porte de 1 mètre 10 centimètres à chaque côté de la voiture permettrait l'entrée et la sortie des malades étendus sur leur lit-brancard. Dans la ruelle large de 1<sup>m</sup>30 qui reste entre les lits, on place des sièges pour les infirmiers et un petit fourneau avec le bouillon et les médecines. Une rangée de fenêtres placées dans le haut du wagon donnerait accès à la lumière du jour, et, pendant la nuit, on allumerait la lampe qui se trouve au milieu du toit. Les blessés et malades moins gravement atteints seraient placés dans les voitures ordinaires de deuxième classe, en ayant soin de ne pas trop les encombrer. Ainsi la composition d'un train-hôpital pour l'évacuation de 150 blessés, parmi lesquels un tiers le sont gravement, pourrait être disposée comme suit :

- 1° Une locomotive ;
- 2° Un fourgon avec les bagages et les armes des blessés ;
- 3° Un fourgon avec le matériel d'hôpital ;
- 4° Deux voitures de deuxième classe avec 60 blessés ;
- 5° Un wagon-hôpital avec 18 hommes atteints de blessures graves ;
- 6° Une voiture de première classe avec des officiers blessés, le chef médical et autres fonctionnaires ;
- 7° Deux wagons-hôpitaux avec 36 hommes grièvement blessés ;
- 8° Une voiture de deuxième classe avec 30 blessés.

Pour évacuer 200 blessés, il suffit d'ajouter à ce train un wagon-hôpital et une voiture de deuxième classe. Dans chaque compartiment de blessés doit se trouver un infirmier avec les ressources de pansement.

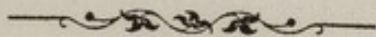
Le projet que nous venons d'exposer est d'une réalisation facile. Alors même que l'administration militaire ne croirait pas, en temps de paix,



devoir faire les frais modiques d'appropriation que nous avons indiqués, les compagnies de chemins de fer pourraient s'en charger avec avantage pour l'exploitation. Ces wagons spéciaux, que l'on pourrait désigner sous le nom d'*alcôves* ou de *dortoirs*, seraient très-utiles en cas de sinistres ou d'accidents si fréquents aujourd'hui, et dans lesquels on est souvent obligé de déposer sur les berges et les accotements de la voie, en plein air et loin de toute habitation, les nombreux blessés de tout âge et de tout sexe.

Ces wagons pourraient encore servir pour le transport des malades ou convalescents qui vont, sous des climats plus doux, chercher le rétablissement de leur santé, et pour lesquels on diminuerait ainsi les risques et les incommodités du voyage. Enfin, ils seraient également utiles pour les personnes âgées ou pour celles qui, obligées de faire rapidement un long trajet, voudraient un lit pour se reposer sans devoir s'arrêter en route. N'y eût-il qu'un ou deux wagons dans le matériel d'exploitation de chaque ligne, le gouvernement pourrait, en cas de guerre, les concentrer sur la ligne de communication de l'armée, afin d'organiser immédiatement des trains-hôpitaux.

Que l'on adopte le moyen que nous venons d'indiquer ou tout autre, il est certain que dans un avenir plus ou moins éloigné, les wagons-hôpitaux seront construits. Les services qu'ils ont rendus en Amérique sont trop évidents; l'absence de ce moyen de transport, ou tout au moins son organisation insuffisante, s'est trop vivement fait sentir pendant la dernière guerre d'Allemagne, pour qu'il ne soit pas sérieusement adopté et organisé. Il est des germes qui ne sauraient rester stériles, et espérons, pour l'honneur de notre époque, qu'il en sera ainsi dans les sociétés chrétiennes du XIX<sup>e</sup> siècle, pour les idées d'humanité et de charité. Ne faudrait-il pas désespérer du progrès et de la civilisation sainement entendus si, en même temps que l'on s'ingénie pour multiplier et perfectionner les engins de destruction, il n'y avait pas aussi des philanthropes qui s'efforçassent d'atténuer les désastres et les horreurs des luttes fratricides?





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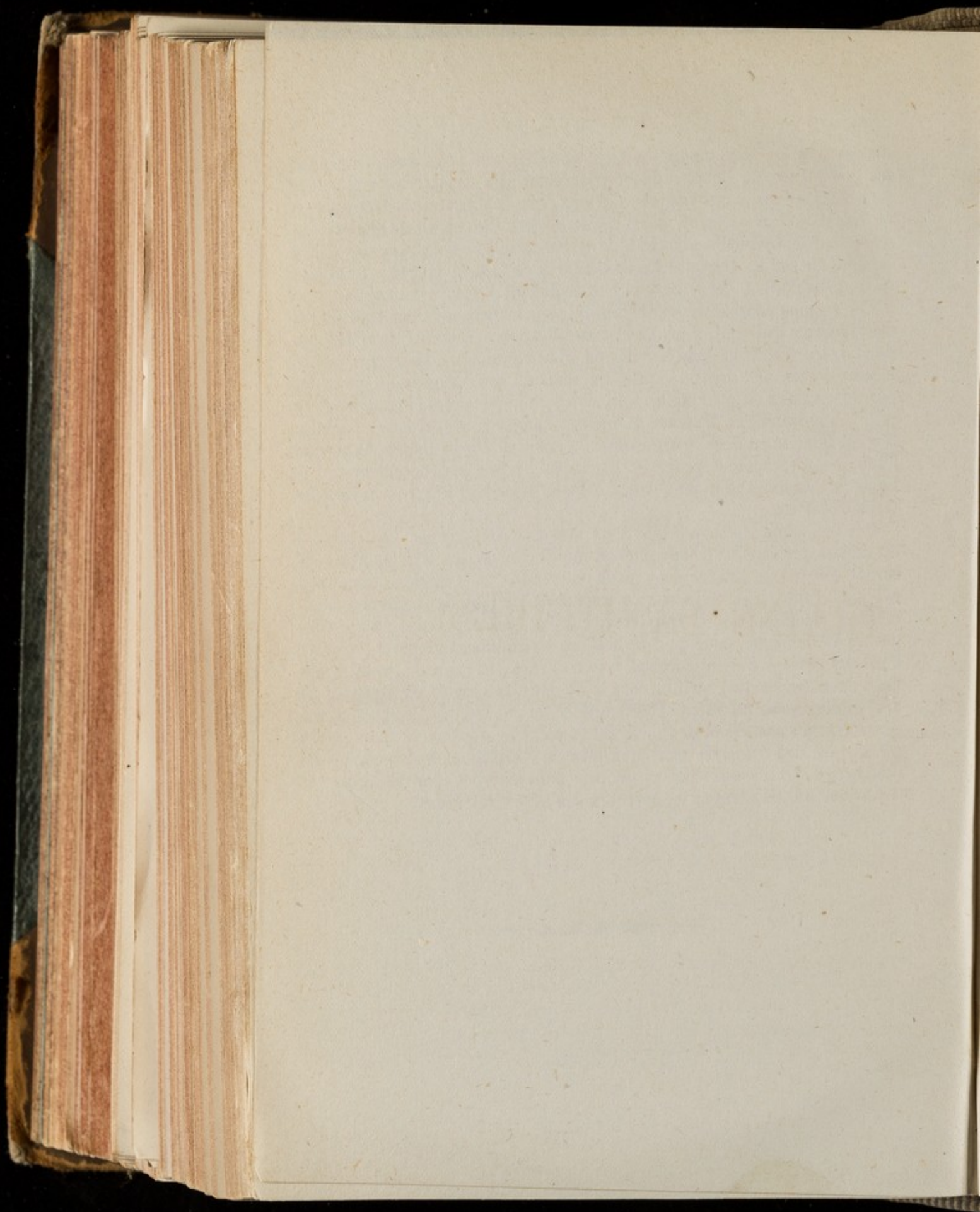


*1883*

LES

TRAINS SANITAIRES







No 324

LES  
TRAINS SANITAIRES



HE III

TRAITÉ DE LA MANÈGE

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ÉTUDE SUR L'EMPLOI DES CHEMINS DE FER

POUR

L'ÉVACUATION DES BLESSÉS ET MALADES

EN ARRIÈRE DES ARMÉES

PAR

le Docteur MORACHE

MÉDECIN-MAJOR DE 1<sup>re</sup> CLASSE

PROFESSEUR-AGRÉGÉ A L'ÉCOLE D'APPLICATION DE MÉDECINE MILITAIRE.

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*Extrait du Journal des Sciences militaires.*

Travail communiqué par la Réunion des Officiers.

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PARIS

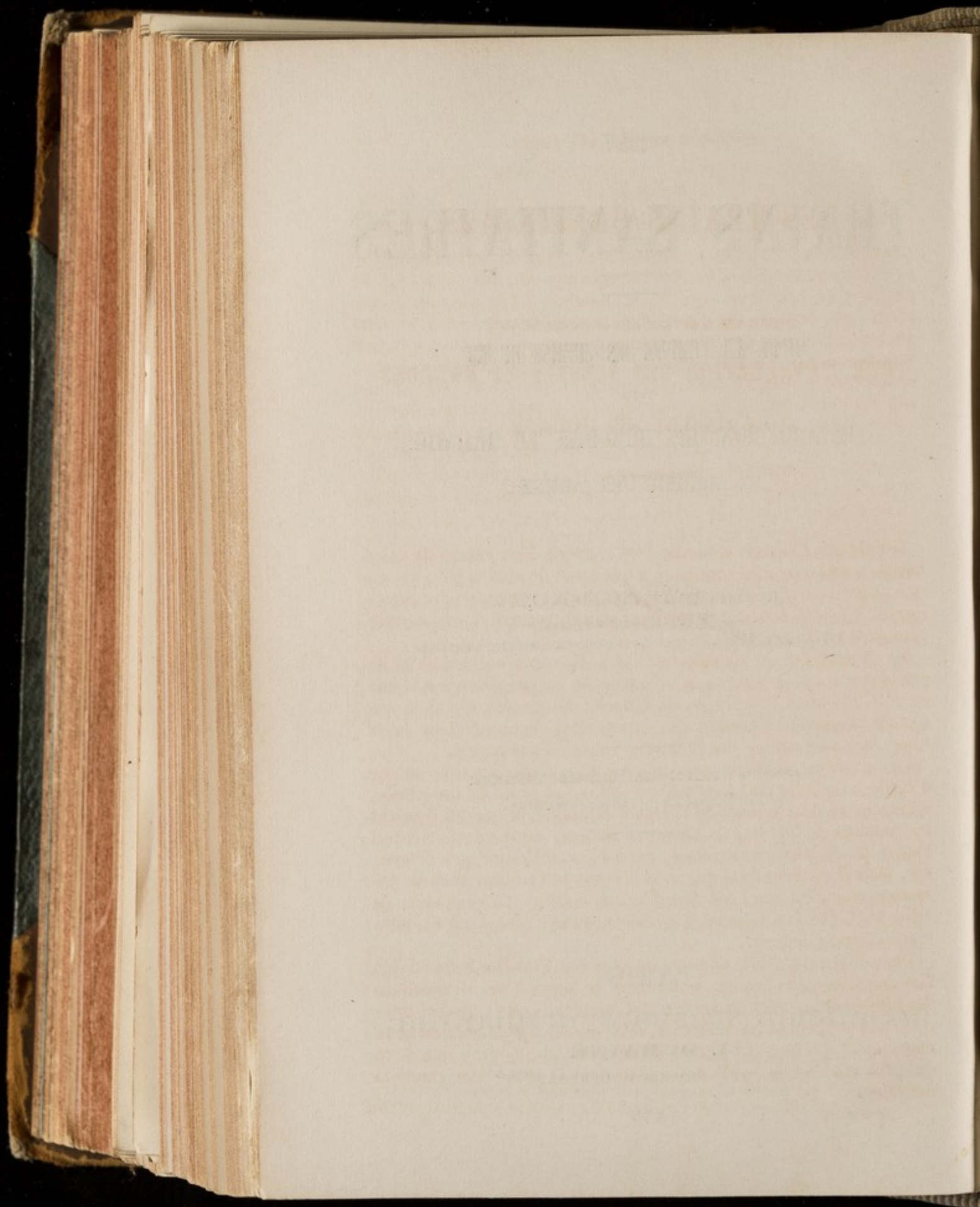
IMPRIMERIE ET LIBRAIRIE MILITAIRES

**J. DUMAINE**

RUE ET PASSAGE DAUPHINE, 30

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1872







# LES TRAINS SANITAIRES

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ÉTUDE SUR L'EMPLOI DES CHEMINS DE FER

POUR L'ÉVACUATION DES BLESSÉS ET MALADES

EN ARRIÈRE DES ARMÉES.

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Depuis que l'Europe moderne s'est couverte d'un réseau de voies ferrées dont les mailles vont en se retrécissant de plus en plus, tandis que la périphérie s'étend tous les jours, l'on a pu comprendre que ce nouvel élément tendrait à modifier singulièrement, à transformer presque l'art de la guerre.

En permettant de transporter à des distances considérables de grandes masses de troupes, les chemins de fer contribuent évidemment à l'élévation progressive de l'effectif des armées, élévation qui semble ne devoir s'arrêter que lorsqu'elles réuniront dans leurs rangs la masse entière des individus valides d'une nation.

Les sciences militaires se sont enrichies d'une nouvelle source d'études : l'officier doit apprendre à utiliser au profit de son armée, à tourner au désavantage de l'ennemi la puissance que lui donnent les chemins de fer. Depuis plusieurs années, cette question a fait l'objet de recherches sérieuses, aussi bien en France qu'à l'étranger, mais il est manifeste que nous n'avons pas su tirer parti de ces ressources autant que l'ont fait d'autres armées. La campagne de 1870-1871 doit évidemment, à ce sujet comme à bien d'autres, nous servir d'enseignement.

Dans ce court travail, nous avons pour but d'étudier l'emploi que l'on doit tirer des chemins de fer dans le service des évacuations des blessés et malades en arrière des armées. Cette question intéresse non-seulement les médecins, mais encore les officiers du commandement qui tous ont à cœur de ne rester étrangers à rien de ce qui peut modifier la santé des soldats dont la patrie leur confie la direction.



## § I.

## IMPORTANCE DES ÉVACUATIONS DES MALADES ET BLESSÉS AUX ARMÉES.

Dès qu'une armée entre en campagne, avant que le premier coup de feu ait été tiré, les malades ne tardent point à se montrer; ce sont tous ceux que les premières fatigues éprouvent au point de compromettre momentanément leur santé, qui ne sont point assez robustes pour se faire de suite à cette vie active que la plupart ne connaissent point encore; ces premières affections ont en général peu de gravité : quelques jours de repos, l'influence stimulante qu'exerce sur le soldat le désir de faire son devoir, l'exemple des camarades suffisent le plus souvent pour remettre sur pied les hommes dont les forces ont trahi l'ardeur.

Peu à peu cependant, l'on voit survenir des maladies plus sérieuses; les influences telluriques, l'action prolongée de la chaleur ou du froid commencent à agir sur les troupes, et, dans les circonstances de campagne en apparence les plus heureuses, en dehors même de toute épidémie, l'armée éprouve des pertes sensibles, ses ambulances, ses hôpitaux se garnissent rapidement de malades. Si la campagne se prolonge avec ses fortunes variables, si les troupes sont forcées de stationner longtemps sur un même sol, si les conditions matérielles d'existence deviennent plus difficiles, le médecin doit s'attendre à voir se propager des germes épidémiques nés sur place (dysenterie, fièvre typhoïde, typhus, etc.) ou apportés quelquefois de fort loin (choléra, variole, etc.).

L'exemple des guerres anciennes et modernes démontre jusqu'à l'évidence que les pertes d'une armée sont bien plus grandes par suite de maladies que par l'action du feu. En Crimée, sur 95,000 décès, nous en comptons 70,000 par maladie (typhus, scorbut, choléra, etc.); en Italie, campagne heureuses s'il en fut et faite dans les circonstances les plus favorables, l'armée a perdu 5,498 hommes, dont 2,500 par maladie<sup>1</sup>. Les chiffres relatifs à la campagne de 1870-1871 ne sont point encore publiés dans leur ensemble; il est donc hors de saison de citer des statistiques isolées qui auraient trait à certains groupes particuliers, mais l'impression que nous avons tous pu en avoir est essentiellement en accord avec ce principe. L'armée allemande n'a encore fourni que des résultats partiels, dont l'on peut cependant conclure qu'elle n'a pas été plus favorisée que la nôtre; quelque sanglants qu'aient été les combats, les deux armées ont beaucoup plus perdu par les maladies que par le feu.

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<sup>1</sup> Voyez Chenu : *Rapport au conseil de santé sur la campagne de Crimée*, Paris, 1855, et *Statistique médicale de la campagne d'Italie*, Paris, 1869.



Nous n'avons point l'intention d'insister sur ces données, non plus que d'en rechercher les causes; elles ont été développées avec talent par d'ingénieux observateurs<sup>1</sup>; nous ne voulons y puiser qu'un enseignement: à savoir qu'une armée qui entre en campagne doit établir ses moyens de secours, non-seulement en prévision du chiffre éventuel de ses blessés, chiffre que l'on peut quelquefois prévoir approximativement, mais en vue du nombre de malades qu'elle aura fatalement et sur la quantité desquels il est difficile de se prononcer à l'avance. Si l'hygiéniste peut souvent annoncer l'imminence d'une épidémie, il n'en est pas de même de son intensité, essentiellement variable suivant les lieux, les époques, les conditions matérielles et morales.

Lorsqu'aux causes morbides permanentes qui sévissent sur une armée viennent tout à coup se joindre les nombreux blessés qu'amènent les combats livrés souvent à de courtes distances les uns des autres, l'on peut comprendre que, quelque nombreuses que soient les ambulances, quelque bien organisés que soient les hôpitaux et les moyens de secours, l'on verra nécessairement s'y produire l'encombrement.

Ce mot d'encombrement n'éveille chez le plus grand nombre que l'idée d'une grande agglomération d'individus; pour l'hygiéniste, pour le médecin militaire en particulier, il est synonyme du plus terrible fléau qui puisse sévir sur une réunion de malades. L'homme, même en bonne santé, ne peut, sans éprouver des accidents sérieux, demeurer longtemps renfermé avec ses semblables; les casernes, les prisons, les habitations trop peuplées en sont la preuve; l'air s'y charge bientôt de principes nocibles dont l'existence a été matériellement démontrée et qui constituent le *miasme humain*; mais lorsque les individus ainsi agglomérés sont des malades ou des blessés, cet air ne tarde pas à acquérir des propriétés toxiques dont l'action n'est que trop rapide. Qui dit encombrement dans un hôpital ou une ambulance, dit aussi plaies blafardes sans tendance à la cicatrisation, érysipèle, pourriture d'hôpital, infection purulente; dans ces conditions il n'est plus de chirurgie ni de médecine possibles: les opérations les plus habilement pratiquées marchent fatalement à une issue funeste, les plaies au début les plus légères se compliquent d'accidents aussi rapides qu'inexorables.

De récentes discussions à l'Académie de médecine, dans les sociétés et la presse scientifiques, et l'impression bien nette que les

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<sup>1</sup> Voyez en particulier un remarquable travail de M. l'inspecteur du service de santé Laveran: *De la mortalité des armées en campagne*, in *Annales d'hygiène et de médecine légale*, 2<sup>e</sup> série, t. XIX, Paris, 1863.



médecins puisent dans leur expérience quotidienne, démontrent que l'influence de l'encombrement se manifeste dès que l'on réunit, en un même point, un certain nombre de malades. C'est en vain que l'on cherche à maintenir la pureté de l'air par tous les procédés de désinfection que la chimie nous donne, c'est en vain que l'on perfectionne les appareils de ventilation : l'encombrement pathologique se produit dans les établissements en apparence les mieux appropriés à leur destination hospitalière. Aussi le médecin juge-t-il de l'existence de l'encombrement non pas sur le cubage d'air dévolu à chaque malade, mais sur la marche qu'affectent les maladies ou les blessures, et se trouve-t-il en pareille circonstance rarement d'accord avec l'administration, qui ne peut apprécier, comme lui, la situation.

Si dans nos hôpitaux réguliers et en dehors de toute condition particulièrement grave, nous voyons trop souvent apparaître les phénomènes d'encombrement, combien plus encore devons-nous le rencontrer dans ces ambulances qui se multiplient à la suite d'une armée, alentour des champs de bataille. Il semble que toutes les conditions les plus désastreuses s'y rassemblent comme à plaisir : multiplicité des blessés, insuffisance d'espace pour les réunir, moyens de secours et personnel toujours hors de proportion avec les besoins, épuisement des blessés par suite des fatigues de la campagne et par celles du combat, voisinage du champ de bataille avec ses émanations pestilentielles. Bientôt, l'une et l'autre armée ont dû remplir de leurs blessés toutes les maisons des villages, tous les groupes d'habitation ; chacune d'elles se transforme en un véritable foyer d'infection, la contrée tout entière devient pour ainsi dire encombrée, car l'on n'y trouve plus un seul point où le médecin puisse espérer des conditions meilleures, des chances plus favorables pour ses blessés.

Tel est, en peu de mots, le tableau que présentent *toujours* les ambulances après les batailles, tableau dont nous avons tous pu vérifier une fois de plus l'exactitude pendant la dernière campagne.

Dans cette terrible occurrence, il ne peut exister qu'une seule planche de salut : la dissémination des malades et des blessés aussi largement que faire se peut. Il faut évacuer au plus tôt et non pas sur les villes voisines, mais autant que possible à grandes distances, car un prochain engagement peut fournir un nouveau contingent de blessés et faire renaître le danger que l'on veut combattre. Si, par la nature de ses opérations, l'armée reste stationnaire, comme pendant un siège par exemple, cette dissémination est peut-être encore plus indiquée, car, par le seul fait de son immobilité, elle ne tarde pas à voir naître des épidémies. Telle a été, pendant la



campagne récente, l'histoire de l'armée allemande autour de Metz et autour de Paris; malgré toutes les précautions prises avec cette régularité, cette méthode et cette intelligente sollicitude pour le soldat qui font honneur aux Allemands, leur armée a éprouvé des pertes fort considérables par la dysenterie et la fièvre typhoïde (typhus abdominal).

L'expérience était depuis longtemps faite pour nous; notre armée a éprouvé en Crimée les mêmes phénomènes; ils se compliquaient, il est vrai, de l'épuisement des soldats et de l'absence de moyens hygiéniques suffisants pour les mettre à même de combattre des influences morbides.

La dissémination des malades ou blessés est importante pour eux à plus d'un titre; elle tend essentiellement à les placer dans des conditions favorables à leur guérison; loin du théâtre des opérations, ils pourront être admis dans de vrais hôpitaux, abondamment pourvus en personnel et matériel, tandis que dans les ambulances, toutes les ressources sont en général précaires; dans les hôpitaux éloignés, les médecins, se trouvant dans des conditions plus normales, ayant à leur disposition les appareils multipliés qui ne peuvent que difficilement figurer dans les ambulances, seront libres d'agir avec calme, de tenter la chirurgie conservatrice, trop souvent impraticable en campagne; en un mot, la dissémination permet d'appliquer aux blessés les règles de la médecine moderne, qui regarde l'hygiène comme le plus indispensable de ses moyens d'action. La dissémination des malades est encore importante pour le reste de l'armée, pour le soldat valide; il n'est pas bon qu'il conserve sous les yeux le triste spectacle qu'offrent les ambulances longtemps encore après l'action; le soldat doit être convaincu que, blessé ou malade, il recevra les soins que son état réclame, mais l'on ne doit point laisser son imagination se frapper à la vue des souffrances de ses camarades; du combat il doit, s'il est possible, ne voir que la gloire et n'emporter que le légitime orgueil du devoir accompli.

Avant la création des chemins de fer, les évacuations de blessés ou malades ne pouvaient en général se faire qu'au moyen de voitures; quelquefois on put utiliser la navigation fluviale ou maritime, et organiser plus ou moins bien un certain nombre de bateaux pour le transport des malades, mais les circonstances où ce mode relativement heureux d'évacuation a pu être employé sont naturellement rares et tout exceptionnelles. En principe, il n'y a d'autre procédé possible que les voitures; celles qui font partie du matériel des ambulances et qui sont disposées pour ce but spécial sont, en général, en petit nombre et ne peuvent du reste s'éloigner beaucoup de l'armée où l'on en a besoin tous les jours. Le transport doit alors s'effec-



tuer, en grande partie, par le moyen de voitures de réquisition de toutes formes et de toutes grandeurs, le plus souvent non suspendues. La seule transformation possible consiste à y placer quelques matelas ou une litière de paille et à y coucher les blessés, en les répartissant dans les véhicules les moins mauvais suivant la gravité de leurs blessures. On peut juger *à priori*, et plus encore par l'expérience de nos campagnes, des inconvénients nombreux de ce mode d'agir qui n'est, à tout prendre, qu'un expédient.

Lorsque les armées n'ont d'autres ressources que les évacuations par voitures, celles-ci sont nécessairement très-limitées. Chaque convoi n'enlève qu'un petit nombre de blessés, sa marche est fort lente et quoiqu'on le fasse accompagner de médecins et d'infirmiers, il est fort difficile d'assurer aux malades les soins médicaux pendant la route; c'est tout au plus si le service des vivres s'exécute convenablement. A chaque halte il faut décharger les voitures; c'est une sérieuse perte de temps et une cause de souffrances pour les blessés. En somme, de pareils convois ne sauraient marcher plusieurs jours de suite et franchir des distances considérables.

En Algérie, pendant nos expéditions, nos colonnes peuvent organiser des évacuations assez régulières, car le nombre des malades n'est pas en général très-grand; ils sont tous transportés sur des mulets de litière ou de cacolet; le convoi est escorté d'une section d'ambulance avec ses tentes, sous lesquelles on couche les blessés pendant la nuit, sans avoir besoin de les sortir de leurs litières. Enfin ces convois n'ont le plus souvent à franchir plus de deux ou trois étapes pour arriver dans un hôpital ou une ambulance fixe.

Dans des circonstances de campagne très-exceptionnelles, l'on peut avoir recours à la navigation maritime et transformer des navires en hôpitaux flottants. Pendant la campagne de Crimée, nous avons évacué de la sorte nos malades sur Constantinople et sur la France, mais les navires dont on se servait n'avaient point d'installations spéciales; ces transports se sont le plus souvent effectués d'une façon regrettable, avec ce désordre et cette incurie que l'on observe toujours lorsqu'on est surpris par des événements que l'on aurait dû prévoir, et qu'on cherche à organiser un service à la hâte, au moment même du besoin.

Plus pratiques que nous, les Américains ont su, pendant la guerre de la Sécession, utiliser pour le transport de leurs malades les nombreux cours d'eau et les voies ferrées qui sillonnent les états de l'Union. D'immenses navires à vapeur furent organisés en hôpitaux et pourvus d'un matériel approprié; le malade, sans changer de brancard, se trouvait enlevé du champ de bataille, placé sur une voiture d'ambulance, embarqué sur un vapeur et enfin couché dans un wagon-hôpital, et, pendant un parcours de plusieurs centaines



de lieues, ne cessait de recevoir les soins les plus parfaits, d'être l'objet des attentions les plus tendres.

Il est fort probable que, dans les guerres de l'avenir, les actions se passeront le plus souvent à peu de distance d'une voie ferrée, car les armées, vu leur nombre, sont obligées de se maintenir à portée d'un chemin de fer qui assure leurs approvisionnements. Le rôle des convois de voitures doit être borné au transport des blessés depuis le champ de bataille jusqu'à une ambulance, ou de celle-ci à la gare la plus voisine, et c'est déjà leur demander des services importants. Il existe dans les diverses armées un grand nombre de modèles différents de voitures destinées au transport des blessés; un plus grand nombre encore ont été proposés par des médecins, des fabricants ou sont la propriété des sociétés de secours. L'on n'a donc vraiment que l'embarras du choix.

En France, nous possédons actuellement deux types de voitures d'ambulance; l'omnibus à quatre roues pouvant recevoir deux malades couchés et trois assis sur le siège, et la voiture à deux roues, dite *voiture-Masson*, qui est légère, maniable, aérée et n'a d'autre inconvénient que le mouvement assez pénible de tangage qu'elle imprime à l'individu qui s'y trouve couché. Avec quelques modifications, elle peut être conservée et convient assez bien pour des transports à petite distance, tels que ceux que nous venons de citer. L'omnibus est un peu lourd, insuffisamment aéré, le nombre des malades qu'il transporte n'est pas en rapport avec sa masse; il y aurait lieu de le modifier, de lui substituer la voiture construite par le baron Mundy, que l'on a vue figurer dans le matériel de la Société française de secours, ou bien enfin le nouveau char-à-banc pour les malades couchés que cette société a récemment adopté. Du reste, tout notre matériel d'ambulance, et en particulier notre lourd et gigantesque caisson, doit être l'objet d'expériences nouvelles; nous n'avons point l'intention d'aborder ici cette question, qui mérite, par son importance, d'être étudiée pratiquement par les personnes les plus compétentes, surtout par des médecins.

Disons-le toutefois, quelque multipliés que soient les moyens de transport réglementaires, il est à la guerre des circonstances où l'on aura recours aux voitures de réquisition, surtout pour les malades légèrement atteints et lorsqu'il ne s'agira que d'évacuations à de minimas distances.

La grande difficulté sera toujours d'avoir, à un moment donné, des moyens de transport tels que la dissémination puisse s'opérer sur une large échelle. Les chemins de fer seuls peuvent suffire à cette tâche; l'on peut arriver, par une bonne organisation, à les adapter à ce service d'une façon si parfaite, que le voyage soit pour le malade une période de repos et de réfection physique et morale.



La campagne de 1870-1871 est, à tous les points de vue, tellement instructive, qu'elle ouvre une nouvelle période dans l'histoire des sciences militaires. En étudiant la question de l'emploi des chemins de fer, il convient donc d'envisager, en premier lieu, ce qui a été entrepris dans ce but depuis les dix dernières années; puis, dans un paragraphe spécial, les faits nouveaux observés pendant la dernière guerre; enfin, les déductions qui doivent en ressortir.

## § II.

### EMPLOI DES CHEMINS DE FER POUR LE TRANSPORT DES BLESSÉS ET MALADES JUSQU'À LA GUERRE DE 1870-1871.

Ce fut pendant la guerre de Crimée que l'on se servit pour la première fois des chemins de fer pour le transport régulier des malades ou blessés militaires; les Anglais utilisèrent pour cet usage la ligne ferrée qu'ils avaient construite entre Balaklava et leur camp sous Sébastopol. L'on n'avait malheureusement pris aucune disposition à l'égard du matériel; les médecins anglais étaient obligés de placer leurs malades dans les wagons à marchandises, aussi ne put-on transporter de la sorte que des gens peu gravement atteints et pour lesquels la situation couchée n'était pas indispensable.

En 1857, sur la proposition du baron H. Larrey, l'administration fit établir une sorte de wagon-ambulance pour le transport des malades entre le camp de Châlons et l'hôpital militaire de cette ville. A cette époque les hôpitaux du camp n'avaient point encore reçu le développement qu'ils ont acquis depuis; ils constituaient plutôt des infirmeries que de véritables hôpitaux; aussi, y avait-il tout avantage à évacuer les malades sur le grand hôpital de Châlons. La création de wagons d'ambulance spéciaux répondait au double but d'assurer aux malades un transport moins pénible, et, en second lieu, de laisser entre les mains de l'autorité militaire un matériel toujours disponible pour les besoins éventuels. La voiture avait été disposée pour recevoir cinq banquettes mobiles sur lesquelles pouvaient prendre place vingt-cinq malades assis; aux deux extrémités du wagon, l'on avait réservé l'espace nécessaire pour un matelas, afin d'y coucher les malades auxquels cette position était nécessaire. Les sièges eux-mêmes étaient facilement enlevables et s'adaptaient indifféremment à tous les wagons, en sorte qu'ils constituaient de véritables brancards sur lesquels on pouvait amener les malades depuis l'ambulance du camp jusque dans le wagon, en leur épargnant ainsi toute espèce de déplacement. Un certain nombre de ces brancards devaient toujours se trouver en dépôt dans les différentes ambulances ou infirmeries divisionnaires.



Pendant la campagne d'Italie de 1859, nous avons pu faire usage des voies ferrées pour chercher à disséminer nos malades et nos blessés dans les différentes villes desservies par le réseau, puis ensuite pour les diriger sur Gênes, où des vapeurs les prenaient et les transportaient jusqu'à Toulon ou Marseille. L'administration n'avait point disposé de wagons spéciaux pour ce service; aussi ne put-on, en général, placer les malades autrement qu'assis dans les voitures à voyageurs ou couchés sur de la paille dans les fourgons à bagages. Dans ces conditions, il n'était point possible d'appliquer aux blessés graves le principe de la dispersion à grandes distances; cependant il y a eu, à cette époque, un véritable progrès d'accompli: des malades, et surtout des blessés en cours de traitement, ont été évacués sur la France, sont parvenus jusqu'à Paris sans que des accidents sérieux se soient produits. Il résulte d'une communication faite à l'Académie de médecine de Paris par le baron H. Larrey<sup>1</sup>, médecin en chef de l'armée d'Italie, que si le système des évacuations entre les champs de bataille et les hôpitaux de réserve, c'est-à-dire ceux des grandes villes, comme Milan, Brescia, Turin, etc., et entre ces établissements et la France, avait été plus largement assuré, par des convois de mulets de cacolet et de litière ou de voitures bien aménagées, pour les petites distances, par des trains de chemins de fer pour les grandes; si, en un mot, l'on eût pu disperser davantage, il n'est pas douteux que les résultats médicaux eussent été supérieurs à ceux que l'on a obtenus. Toutefois, il faut reconnaître que les circonstances éminemment favorables dans lesquelles nous nous trouvions, celles d'une armée victorieuse opérant en belle saison dans un pays ami, et les mesures que l'on prit pour assurer, autant que possible, la création de nombreux hôpitaux, ont à peu près évité l'encombrement et le développement des épidémies graves dont on était menacé.

La période de paix européenne qui s'étend de 1859 à 1864 fut pour les diverses armées continentales, en particulier pour l'Allemagne, une époque d'étude et de préparation. La guerre d'Italie venait de montrer avec quelle rapidité les armées pouvaient se transporter à de grandes distances; l'expérience de 1859 constatait pratiquement l'importance des chemins de fer au point de vue militaire; aussi les différentes puissances se mirent-elles en mesure d'adapter leur matériel roulant au transport des troupes et des approvisionnements. Pendant que ces travaux se poursuivaient, la guerre de la Sécession américaine venait fournir à l'Europe de nouveaux sujets d'études. Le génie inventif des Américains, leur patrio-

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<sup>1</sup> Voyez *Bulletin de l'Académie de médecine*, t. XXVII, p. 443, Paris, 1864.



tisme, la confiance qui les caractérise, l'ardeur qu'ils mettent à atteindre le but qu'ils se sont tracé, le *Go a head*, en un mot, devaient donner des résultats de nature à modifier profondément les principes militaires de la vieille Europe. Les Américains, ceux du Nord en particulier, qui montrèrent, sinon plus de courage, mais peut-être plus de ténacité que leurs adversaires, surent utiliser pour leurs armées toutes les ressources de l'industrie moderne, de la science pratique qu'ils ont le mérite de pousser toujours à l'extrême. Le rôle qu'ils arrivèrent à faire jouer à leurs chemins de fer, pendant une campagne dont les différentes phases se déroulèrent sur un immense théâtre, en est une des preuves les plus frappantes.

Pendant les premières périodes de la campagne, les armées du Nord, comme celles du Sud, se servaient pour le transport de leurs malades des wagons ordinaires à voyageurs ou à marchandises et durent constater les déplorables conséquences de ce système d'expédients. Cependant, dès le mois de juin 1863, le docteur Letterman, médecin de l'armée opérant sur le Potomac, ayant à évacuer 925 malades ou blessés avec un matériel considérable, de Fredericksburg à Washington, établit de véritables trains sanitaires entre la première de ces places et le port d'Aquia-Creek, où stationnaient les navires-hôpitaux. Il avait disposé les wagons de telle façon que les malades les plus graves pouvaient, sans changer de brancard, être placés dans les wagons en quittant Fredericksburg, débarqués à Aquia et embarqués sur les navires; les plus légèrement atteints faisaient le voyage en chemin de fer, assis dans des wagons ordinaires. A chaque train sanitaire étaient attachés un certain nombre de médecins et d'infirmiers, pourvus d'objets de pansement, en sorte que les soins médicaux se continuaient pendant la route. Vers la fin de 1863, le gouvernement de l'Union, sur les propositions du docteur Harris, membre de la commission sanitaire, adopta un modèle de wagon pour le transport des malades dont l'état exigeait le maintien dans la position horizontale. On transforma dans ce but les wagons ordinaires des compagnies de chemins de fer, qui s'adaptent merveilleusement à ce service spécial. Ces voitures sont infiniment plus longues et plus hautes que les nôtres, elles ne présentent point de compartiments à l'intérieur, mais constituent une sorte de grande pièce, où les sièges sont disposés de chaque côté de façon à laisser libre un passage à la partie médiane. A chaque extrémité de la voiture se trouve une plateforme avec balustrade qui communique, par une porte, avec l'intérieur du wagon, et, par un pont-volant, avec la voiture voisine. Les voyageurs peuvent ainsi circuler d'une extrémité à l'autre du train, ce qui est indispensable en raison des grands trajets que parcourent les trains en Amérique. Cette même disposition a, du reste, été adoptée en Europe



sur quelques lignes de Suisse et d'Allemagne, et beaucoup de personnes ont pu en apprécier les avantages.

De chaque côté du passage central l'on établit deux rangs de fortes colonnes massives en bois laissant entre elles l'espace nécessaire pour un brancard, et dont l'écartement mesurait exactement aussi la largeur d'un brancard. (Voyez *fig. 1.*) Entre ces colonnes l'on put ainsi placer les brancards, suspendus au moyen de forts anneaux en gutta-percha qui, embrassant les poignées du brancard, venaient s'appuyer sur de très-grosses chevilles en bois fixées dans la colonne. (Voyez *fig. 2.*) Comme les poignées des brancards devaient nécessairement dépasser un peu les poteaux, il n'était pas possible de les placer tous à la même hauteur, aussi avait-on adopté une sorte de disposition alternante, en sorte que si entre deux colonnes il se trouvait trois brancards superposés, entre les suivantes, l'on n'en plaçait que deux. Les dimensions des wagons américains permettaient de loger de chaque côté seize brancards, divisés en quatre séries de trois et deux séries de deux, et laissant encore au centre du wagon un large espace vide occupé par un poêle et quelques sièges. Le wagon tout entier pouvait de la sorte renfermer trente-deux malades couchés.

Les brancards dont on fit usage ressemblent assez à ceux qui font partie du matériel d'ambulance français; ils consistent en une forte toile présentant de chaque côté et dans le sens de la longueur une coulisse dans laquelle on fait glisser une hampe arrondie terminée par des poignées. Une pièce mobile en bois vient se fixer aux deux extrémités et maintient l'écartement entre les hampes. Les dimensions du brancard américain avaient été calculées de telle façon qu'au moyen des anneaux de gutta-percha on pouvait le suspendre également dans une voiture d'ambulance, dans un wagon ou dans un navire-hôpital; tout le matériel d'évacuation avait été disposé pour que le malade, enlevé sur un brancard du champ de bataille, pût, sans déplacements ultérieurs, voyager sur terre et sur eau sans avoir à craindre ces transbordements souvent pénibles, et qui constituent toujours une perte de temps. Les anneaux en gutta-percha rendaient de grands services; ils amortissaient singulièrement les chocs que l'on éprouve fatalement dans une voiture même bien suspendue ainsi que dans le meilleur wagon; l'élasticité des hampes du brancard, faites en bois à longues fibres, s'ajoutait encore à celle des anneaux, en sorte que le malade ne recevait en réalité qu'un minimum de secousses fort supportables. Au commencement, l'on se servait d'anneaux en fils de gutta-percha tressés, mais l'expérience fit admettre bientôt de forts anneaux d'un plus large diamètre et d'une bonne épaisseur qui résistaient assez bien au poids qu'ils avaient à supporter. Quelques-uns se rompirent néan-



moins; le même inconvénient a été signalé plus tard dans les trains sanitaires allemands, dont nous aurons à parler plus loin.

La ventilation et l'éclairage du wagon américain étaient assurés par de larges fenêtres garnies de vitres mobiles, percées de chaque côté de la voiture, et par une sorte de claire-voie, disposée sur la partie centrale de la toiture, assez semblable par sa forme aux panneaux mobiles qui, sur les navires, envoient l'air et la lumière dans les salons situés dans l'entrepont; la partie verticale de ces claires-voies était seule garnie de petites fenêtres que l'on pouvait ouvrir sans que la pluie pût pénétrer dans la voiture. Lorsqu'il en était besoin, l'on n'avait enfin qu'à ouvrir l'une des portes ou les deux portes pour produire un violent courant d'air qui balayait l'intérieur de la voiture. Cette précaution était indispensable lorsque les trente-deux brancards étaient occupés par des malades et des blessés porteurs de claies encore en suspension.

Dans l'espace resté libre au centre de la voiture se trouvait un poêle qui servait à la fois pour la coction des aliments, la préparation des tisanes et le chauffage du wagon. Ce poêle jouait aussi le rôle de ventilateur par le tirage qu'il exerçait sur l'air contenu dans le wagon. Un certain nombre de voitures, réunies à la suite l'une de l'autre, constituaient un véritable hôpital roulant auquel étaient attachés des médecins, des infirmiers, souvent aussi des dames-infirmières, qui formaient ainsi un personnel hospitalier complet, pourvu de tous les objets matériels nécessaires, tels que médicaments, objets de pansement, provisions de vivres, etc. Une de ces voitures pouvait être attachée à un train ordinaire et fonctionner séparément, ses dimensions lui permettant de renfermer, outre les malades, un personnel de service suffisant pour les trente ou trente-deux personnes qu'elle contenait.

Nous avons décrit avec quelques détails ce wagon-ambulance dont les Américains ont su tirer un parti considérable, parce qu'il a servi de modèle aux trains sanitaires organisés plus tard en Europe. A l'Exposition universelle de 1867, on en a pu voir un modèle réduit exposé, avec divers autres objets afférents au matériel des ambulances, par un médecin américain, le docteur Evans.

La création des wagons-ambulances fait honneur aux Américains; elle était singulièrement facilitée du reste par la grandeur des wagons ordinaires à voyageurs, qui se sont parfaitement prêtés à une transformation, tandis que, dans les chemins de fer européens, l'on est toujours arrêté par l'exiguïté du matériel en usage sur nos voies ferrées.

Le plus grand titre de gloire des Américains est d'avoir donné une extension jusque-là inconnue aux moyens de secours des malades et blessés, d'avoir su vaincre l'apathie que le gouvernement



montrait au début, et, par la seule initiative individuelle, d'avoir organisé un service médical indépendant, auquel l'on n'a marchandé aucune des ressources nécessaires.

Les Américains consacrèrent à leurs malades et blessés plus de 400 millions de francs (80,000,000 de dollars) dus à des contributions volontaires dans tous les états de l'Union. Aussi les Américains ont-ils pu, à la fin de la guerre, établir une statistique de leurs hôpitaux et ambulances, auprès de laquelle celles des anciennes armées européennes ne sont que de tristes nécrologes.

En 1860, le gouvernement prussien mettait à l'étude la question du transport des malades sur les voies ferrées, en créant une commission chargée d'expérimenter les projets présentés par le docteur Gurlt, professeur de chirurgie à l'Université royale de Berlin. Dès les premières expériences, on se trouva arrêté par une difficulté matérielle : M. Gurlt proposait de suspendre dans les wagons des hamacs à peu près semblables à ceux que l'on emploie à bord des navires, mais il se trouva que les plafonds des wagons n'avaient pas la résistance nécessaire pour supporter le poids des hamacs ; les crochets auxquels il fallait les suspendre ne se fixaient point suffisamment dans la toiture, ou bien celle-ci cédait sous l'effort. On parvint cependant à vaincre cette première difficulté, mais il s'en présenta de nouvelles : lorsque le train se mettait en marche, les malades, couchés dans les hamacs, se trouvaient soumis à une sorte de balancement latéral occasionné par le mouvement de lacet du wagon, perceptible même au centre du train et sans nul doute exagéré par ce fait que les hamacs reposent simplement sur deux points ; puis, lorsque des chocs venaient à se produire, lors de la mise en route, des arrêts, ou même pendant la marche, les hamacs se heurtaient les uns contre les autres et même contre les parois du wagon, ce qui est fort dangereux lorsque l'on a affaire à des blessés. Enfin, il nous semble que, d'une façon générale, le hamac ne convient en aucune façon au transport des blessés ; dans le hamac, l'homme est toujours couché sur une surface courbe, il est impossible d'y placer un individu atteint de plaie, surtout lorsque celle-ci a nécessité l'application d'un appareil. Sur les navires, l'on a pour ce service recours à des *cadres*, c'est-à-dire à des hamacs très-larges, dont le fonds est constitué par un cadre en bois à fond de toile, en sorte que, malgré la suspension, la courbure ne peut se produire ni en long, ni en large. On pourrait donc, à la rigueur, employer les cadres dans les wagons, mais l'on n'éviterait ni les chocs, ni ce mouvement de lacet qui, dans les expériences faites en Allemagne, a été suffisant pour donner le mal de mer aux individus transportés.

La commission chercha en vain à modifier le mode de suspen-



sion des hamacs; elle dut abandonner ce système et se borner à en recommander un autre plus simple en apparence : celui de recouvrir le plancher du wagon d'une épaisse couche de paille et d'y étendre les malades les uns à côté des autres, en les plaçant toutefois chacun sur une paillasse séparée. Les paillasses devaient être munies de chaque côté de trois fortes brides de toile, dans lesquelles on pouvait passer des hampes de brancard. Le malade se trouvait ainsi enlevé du champ de bataille ou de l'ambulance, embarqué dans le train, et débarqué à l'arrivée, sans changer de matelas.

Une instruction du ministère de la guerre prussien, en date du 1<sup>er</sup> juillet 1861, réglait le transport des blessés et malades sur les chemins de fer. En voici le résumé : 1<sup>o</sup> Les blessés peu gravement atteints, en particulier ceux dont les blessures siègent aux membres supérieurs, seront placés dans les wagons de 1<sup>re</sup>, 2<sup>e</sup> ou 3<sup>e</sup> classe, selon la gravité du cas et aussi suivant le grade du militaire; l'on aura soin, dans tous les cas, de les faire asseoir de façon que la plaie soit dirigée du côté de l'intérieur du compartiment, afin que l'homme puisse confortablement s'appuyer dans un coin. 2<sup>o</sup> Les blessés graves, ceux en particulier qui sont atteints des plaies des membres inférieurs, seront placés dans des fourgons à bagage que l'on matelassera avec de la paille comme il a été indiqué plus haut. 3<sup>o</sup> Chaque fourgon doit recevoir six à huit blessés, trois couchés de chaque côté dans le sens de la longueur et deux dans les intervalles. L'espace laissé libre entre les litières est réservé aux gens de service. 4<sup>o</sup> La désignation de ce personnel doit être laissée au médecin; mais, en principe, pour cent malades graves, il n'y aura pas moins de un ou deux médecins et quinze aides de santé. L'on ne devra remplacer les infirmiers par des soldats des compagnies sanitaires que dans les cas d'urgence et lorsque leur retour sera assuré; enfin il est bon d'employer toujours les mêmes agents pour le service. 5<sup>o</sup> Les voitures occupées par les blessés doivent tenir le milieu du train, afin d'éviter le mouvement de lacet. Le transport s'effectuera à grande vitesse; l'on ne s'arrêtera que pour prendre de l'eau ou dans des cas exceptionnels. Les fenêtres resteront ouvertes sous le vent, pour donner l'air et la lumière. Les médecins doivent être munis de tous les objets nécessaires pour faire des pansements, arrêter des hémorrhagies et faire face à des besoins imprévus. Les infirmiers obéiront absolument aux instructions que donneront les médecins; dans un cas grave, ils pourront faire arrêter le train en hissant sur le wagon un drapeau spécial. 6<sup>o</sup> Les compagnies de chemins de fer et les chefs de gare seront prévenus de l'arrivée du train, afin de prendre leurs dispositions, faire procéder rapidement au déchargement des malades, et



renvoyer sans délai au point de départ le personnel et le matériel du train sanitaire.

Pendant la guerre des duchés (1864) et celle de Bohême (1866), les Prussiens ont suivi ces précédentes instructions qui leur ont permis de faire en arrière de leurs armées de nombreuses évacuations; cependant ils reconnurent bientôt que ce service exigeait encore de nouvelles améliorations et que, en particulier, le mode de couchage était essentiellement défectueux; aussitôt après la paix, ils se mirent à préparer un nouveau matériel et à étudier la question encore plus à fond.

Pendant cette même guerre de 1866, l'armée autrichienne avait aussi fait usage de wagons pour transporter ses blessés, mais on les avait, comme en Prusse, simplement couchés sur le plancher de la voiture, préalablement garni de paille. Le baron Mundy, qui a eu charge de l'aménagement de ces trains et de la direction de ce service, n'hésite pas à déclarer combien cette litière de paille est insuffisante; sous le poids du malade et par suite du mouvement de trépidation qui est une conséquence forcée de la marche, elle ne tarde pas à se déplacer, à se tasser; au bout d'un ou deux voyages, elle ne forme plus qu'une couche insuffisante pour amortir les chocs ou constituer un couchage approprié à des blessés. Il faut alors la renouveler; or, en temps de guerre, ce n'est pas toujours chose facile que d'avoir, à portée, de grands approvisionnements de paille. Enfin, il est encore un autre inconvénient : les malades étant tous couchés à terre, les médecins et les aides doivent s'accroupir pour faire les pansements, pour leur donner des soins; ils gardent ainsi une position fort gênante dans laquelle on est toujours plus ou moins maladroit; c'est peut-être là un faible désavantage, mais il mérite d'être pris en considération, car il ne permet pas d'assurer aux blessés tous les soins dont ils ont besoin.

Tandis que ces études se poursuivaient en Allemagne, l'armée anglaise opérant dans les Indes avait, elle aussi, à se préoccuper du transport de ses malades par voies ferrées; elle ne l'appliquait encore qu'aux troupes lors de leurs changements de garnison et surtout lors de leurs rapatriements réguliers sur la métropole; mais en raison des grandes distances que les corps stationnés dans l'intérieur ont à franchir pour gagner les ports d'embarquement, en raison des difficultés considérables du transport dans un pays tropical, il était indispensable d'assurer aux malades un mode d'évacuation compatible avec leur état. En 1867, sur la proposition du médecin inspecteur général Beatson, le gouvernement colonial chargea la compagnie des chemins de fer des Indes-Orientales de construire un certain nombre de wagons destinés spécialement au transport des malades. Sans s'écarter très-sensiblement du modèle



adopté pour les wagons à voyageurs, ces voitures ne devaient pas mesurer moins de 24 pieds anglais (7<sup>m</sup>,30) de longueur si elles étaient destinées à recevoir six malades, ou 32 (9<sup>m</sup>,72) si elles en devaient renfermer huit. La porte s'ouvre près de l'une des extrémités du train, afin de faciliter l'introduction des brancards, mais toujours sur la face latérale, en sorte que la communication n'est pas possible pendant la marche, ce qui est une condition très-défavorable pour la bonne exécution du service.

La grande exposition de 1867 avait réuni à Paris les modèles les plus perfectionnés des engins de destruction; à côté de ces exhibitions autour desquelles la foule se pressait tous les jours, l'on put voir dans un coin du Champ-de-Mars une exposition plus modeste que fréquentaient généralement seuls quelques militaires ou les médecins des diverses nationalités. La France n'y était malheureusement représentée que par un matériel dont l'infériorité sautait aux yeux, surtout lorsqu'on le comparait aux objets exposés par les autres puissances. Les États-Unis se distinguaient, entre toutes les puissances, par un nombre remarquable d'objets destinés au service des hôpitaux, par des voitures de toutes sortes et par un modèle de leur wagon-ambulance; l'Allemagne présentait également une grande variété de brancards, de lits à suspension, d'appareils dus en grande partie à la fabrique spéciale de MM. Fischer, d'Heidelberg.

Les divers gouvernements qui avaient envoyé des délégués à l'Exposition et la Société de secours française jugèrent le moment opportun pour mettre en expérience quelques-uns des moyens de transport proposés, en particulier pour étudier la question du transport des malades en chemin de fer.

Le comité badois proposait un brancard destiné à s'accrocher aux banquettes opposées d'un compartiment de 3<sup>e</sup> classe, ou même, à défaut, dans un wagon de marchandises. Cet appareil offrait ceci de particulier qu'au lieu de hampes de bois, il se soulevait au moyen de tubes métalliques horizontaux que l'on sortait à volonté des brancards et qui se trouvaient terminés par un anneau dans lequel on passait une forte courroie de cuir. Par le moyen de ces courroies, on pouvait accrocher le brancard aux dossiers opposés des banquettes dans les wagons de 3<sup>e</sup> classe qui n'ont pas de compartiment; on pouvait aussi les placer au nombre de deux ou trois sur des traverses de bois fixées transversalement, dans les wagons à marchandises, au moyen d'anneaux et de courroies.

Une commission nommée par le ministère de la guerre français expérimenta les appareils de MM. Fischer; elle fut unanime pour les trouver avantageux: cependant les portières de nos wagons étaient un peu étroites pour l'introduction des brancards; elle fut unanime aussi pour admettre que, jusqu'à nouvel



ordre, le meilleur système était encore celui de garnir les planches des wagons d'épaisses litières en paille : nous avons déjà indiqué que la commission prussienne, réunie en 1860, avait, sur ce même système, émis un avis tout différent.

Les expériences portèrent aussi sur deux brancards proposés l'un par le comité badois, l'autre par M. le médecin-major Gauvin. Tous les deux ils étaient construits de manière à renfermer en eux-mêmes leur appareil de suspension, en sorte que, dans quelque voiture qu'on les voulût placer, le malade se trouvait à l'abri des chocs. Le brancard Gauvin, qui peut à volonté être adapté sur deux roues et se transformer en brancard à mains, est muni de petites roulettes qui permettent de le faire glisser facilement sur le sol et facilitent son introduction dans un wagon. Très-vivement apprécié à l'Exposition, ce brancard fut, en 1868, l'objet de nouvelles expériences sur le chemin de fer de l'Est; la commission mit dans un même wagon un brancard Gauvin, deux matelas complets et cinq bottes de paille, afin de mieux juger par comparaison; elle fut entièrement d'accord pour regarder le brancard comme infiniment supérieur tant au point de vue de l'isolement relatif dans lequel il place le malade, par rapport à la trépidation du train, qu'à celui du nombre moindre de porteurs nécessaires pour l'introduction dans le wagon. Elle admit que l'on pouvait aisément disposer huit brancards par wagons à marchandises dans le sens de l'axe, en réservant encore un petit espace libre entre les deux grandes portes que présentent ces voitures.

MM. Fischer offrirent en outre d'autres appareils destinés à être placés dans les wagons de première ou deuxième classe, afin d'y coucher un malade perpendiculairement à l'axe, en prenant appui sur les banquettes; ils proposèrent aussi un système très-simple qui permet de réunir les banquettes opposées d'un wagon de troisième classe, et de transformer tout l'intérieur du compartiment en une surface plane sur laquelle on peut disposer des matelas.

Il est certain que tous les appareils que nous venons de décrire ont leurs avantages, mais quelques-uns ne peuvent en aucune façon être utilisés pour le service militaire, ceux par exemple qui ne permettent de placer qu'un malade par compartiment; si, au contraire, l'on en place davantage, comme dans le système Fischer pour les voitures de troisième classe, ils ne sont plus à l'abri des secousses, sont exposés à se heurter les uns les autres, et ne sont pas mieux couchés que sur le plancher d'un fourgon à bagages.

Les appareils Gauvin ou autres analogues conviennent bien pour le blessé, en ce sens qu'il se trouve bien couché, mais ils ne permettent pas, surtout dans les wagons garnis de huit brancards, de circuler à l'aise autour des malades et de leur porter facilement les



soins les plus indispensables. Enfin, ils sont tous assez coûteux, et l'on est naturellement porté à rechercher si l'on ne pourrait, avec d'autres dispositions, assurer aux blessés un transport aussi doux, en leur donnant en route des soins équivalents à ceux qu'ils recevraient dans un hôpital bien organisé.

Aussitôt après la campagne de Bohême, le gouvernement prussien, plus convaincu que jamais de la nécessité d'organiser le service médical de ses armées, avait nommé à cet effet une commission de médecins, renfermant toutes les illustrations militaires et civiles, dont les propositions, bientôt formulées, furent suivies d'une série d'ordonnances royales : celle du 20 février 1868 et celle du 29 avril 1869, en particulier, règlent le service médical des armées allemandes sur le pied de paix et sur le pied de guerre.

M. le docteur Esmarch, membre de cette commission, s'était spécialement chargé de l'organisation du service de transport sur les chemins de fer. Il résolut d'appliquer en Allemagne les principes qui avaient présidé à l'organisation des trains sanitaires en Amérique, et s'entendit à ce sujet avec le constructeur de ces trains, alors de passage en Allemagne, aussi bien qu'avec les principales compagnies de chemins de fer. On reconnut que les wagons wurtembergeois se prêtaient parfaitement à la transformation ; ils mesurent, en effet, 38 à 39 pieds (11<sup>m</sup>,80 à 12<sup>m</sup>) de long sur 8 à 9 de large (2<sup>m</sup>,50 à 2<sup>m</sup>,80), et sont montés soit sur quatre, soit sur huit roues. Les sièges, disposés perpendiculairement à l'axe, laissent entre eux un passage communiquant avec deux portes placées aux extrémités de la voiture, en sorte que, grâce aux perrons qui relient entre eux les différents wagons, il est facile de circuler d'une extrémité du train à l'autre. L'on n'a donc plus qu'à enlever les sièges pour avoir à sa disposition de véritables chambres, qu'il est facile de transformer en hôpital roulant.

La commission proposa aux ministres de la guerre et du commerce d'ordonner la construction de semblables voitures *en vue d'une guerre prochaine*, et bientôt, en effet, les chemins de fer hanovriens furent pourvus de ce nouveau matériel. Les voitures sont longues de 24 pieds (7<sup>m</sup>,50), larges de 8 pieds (2<sup>m</sup>,50) et hautes de 6 (1<sup>m</sup>,90) ; elles constituent la quatrième classe, destinée à ne pas recevoir de sièges, les voyageurs restant debout pendant le trajet, ainsi qu'il en était dans nos voitures de troisième classe, au début des chemins de fer, vers 1845. Au point de vue de la transformation ultérieure, cette absence de sièges est un avantage de plus.

Au mois de juin 1868, soixante-dix voitures, nouveau modèle, avaient déjà été construites ; leur nombre fut bientôt encore augmenté ; l'on transforma aussi d'anciens wagons hanovriens, en



sorte que, au moment de la guerre de 1870, le ministère de la guerre pouvait disposer de 200 wagons aptes à recevoir des malades.

La transformation adoptée par la commission fut la suivante : laissant de côté le système proposé, lors de l'exposition de 1867, par MM. Fischer, comme ne mettant pas suffisamment les malades à l'abri des chocs, elle adopta le principe de suspension des Américains, et, pour cela, fit disposer dans les voitures quatre couples de colonnes en bois le long de la paroi extérieure; les deux couples extrêmes sont distants de la paroi terminale de 7 centimètres seulement, mais ils présentent entre eux un intervalle moyen de 2<sup>m</sup>,25 à 2<sup>m</sup>,40, très-largement suffisant pour un brancard; les deux colonnes faisant partie d'un même couple sont écartées l'une de l'autre de 70 centimètres, et comme les poutres ont elles-mêmes 7 centimètres d'épaisseur, on peut donner au brancard une largeur de 77 centimètres, très-suffisante pour le couchage d'un malade.

Le mode de suspension des brancards, qui fut adopté après de nombreux essais, présente un perfectionnement par rapport au système américain. Dans ce dernier, l'anneau de gutta-percha embrasse à la fois la tige fixée dans la colonne et la hampe du brancard; elle s'use assez rapidement et peut accidentellement se rompre. L'on modifia heureusement cette disposition, en passant un anneau de cuir autour de la hampe et en garnissant de cette substance l'anneau en fer fixé dans la colonne; la gutta-percha ne frotte plus dès lors que sur du cuir et il paraît que, grâce à cette précaution, elle résiste beaucoup plus et ne se rompt que très-exceptionnellement. Du reste, dans beaucoup de ces wagons, et pour prévenir tout danger, on avait eu soin de fixer des barres horizontales de fer entre les colonnes, en sorte que, en cas de rupture des anneaux, le brancard tombait sur ces barres et non sur le brancard inférieur.

Dans chaque espace longitudinal entre les colonnes, on peut loger deux brancards superposés en alternant leur hauteur, c'est-à-dire que les brancards des espaces extrêmes se trouvant sur une même ligne, ceux de l'espace intermédiaire leur sont un peu inférieurs; c'est, du reste, une disposition nécessaire pour permettre aux hampes des brancards de dépasser un peu la colonne.

Les brancards, essentiellement constitués par un fort cadre de bois à fond de toile, présentent à l'une de leurs extrémités une partie mobile qui se relève et se fixe au moyen d'une tige garnie de plusieurs dents, en sorte que le malade peut avoir la tête plus ou moins relevée, suivant son désir; ils sont également garnis de



pieds, afin que le malade ne touche pas le sol lorsqu'on pose le brancard à terre, et de rebords qui l'empêchent de tomber aussi bien quand on le charge que lorsqu'il est suspendu.

Chaque wagon peut contenir seize malades couchés, et si l'on compte que le gouvernement allemand possédait 200 wagons de ce modèle, l'on arrive à calculer que, dès le début des hostilités, il avait 3,200 places assurées sur les chemins de fer pour le transport de ses blessés. Pendant la guerre, ces nombres ont été considérablement dépassés.

Les wagons communiquent tous entre eux bout à bout, mais il n'est pas toujours commode d'y introduire les brancards lorsqu'ils sont réunis en train; il est préférable, pour charger le wagon, de le détacher, et l'éloigner un peu de son voisin; les porteurs de brancards arrivent alors sur la voie, et, plaçant leur fardeau dans l'axe de la porte, le font très-facilement glisser sur la plate-forme, puis de là dans l'intérieur de la voiture.

L'instruction du 26 avril 1869 prescrit dans ses paragraphes 36 à 45, ainsi que dans ses annexes 12 et 13, toutes les dispositions qui doivent régir le service des évacuations, ses rapports avec celui des étapes, le choix du personnel accompagnant les évacuations, etc. A propos de la désignation des malades, des soins dont ils doivent être entourés, elle entre dans des détails que nous trouverions peut-être souvent minutieux, mais qui ont cet immense avantage de ne rien laisser à l'imprévu et de bien tracer à chacun sa ligne de conduite, en sorte que, au moment de l'action, il ne règne aucune incertitude. En campagne, la part de l'imprévu s'impose d'elle-même; il faut, disent les Allemands, la diminuer, par avance, autant que possible, et, s'il se peut, régler même les exceptions qui ne tardent pas à se montrer.

Nous allons, du reste, voir, par l'étude du service des évacuations de l'armée allemande, en 1870-71, les avantages remarquables qu'ils ont retirés de cette façon de comprendre leur devoir.

### § III.

#### EMPLOI DES CHEMINS DE FER POUR LE TRANSPORT DES MALADES ET DES BLESSÉS PENDANT LA CAMPAGNE 1870-1871.

Le service des évacuations de malades ou blessés en arrière des armées est intimement lié, dans l'armée allemande, au service général des étapes, dont il convient de dire ici quelques mots; l'on en trouvera, du reste, une analyse plus complète dans le n° 25 de la



*Revue militaire de l'Etranger*, 1872, et l'ouvrage spécial de M. C.-H. Beck <sup>1</sup>.

Chaque corps d'armée allemande possède, dans l'étendue de sa circonscription territoriale, un point fixe, ordinairement situé dans une localité importante, qui sert de concentration au corps d'armée; de là partira tout ce qui doit être envoyé au corps d'armée mobile, là viendra aboutir tout ce qui en revient, c'est l'*Etappen-Anfangs-ort*; le long de la route, qui rejoint ce point au corps d'armée, sont installés des gîtes d'étapes (*Etappen-ort*), éloignés de 20 à 24 kilomètres les uns des autres si la route suit une voie ordinaire, de 150 à 200 kilomètres si elle suit, au contraire, une voie ferrée; dans ce cas, les gîtes d'étapes prennent le nom d'*Eisenbahn-Etappen-ort*. A l'extrémité de la route, du côté de l'ennemi, existe un point de concentration nommé *Etappen-Haupt-ort*, où l'on réunit les troupes et les objets matériels destinés au corps d'armée ou ceux qui en reviennent. Ce dernier point ne se trouve pas dans la sphère même d'action des troupes, mais à une ou deux journées de marche en arrière; si le corps d'armée fait un mouvement en avant, son *Etappen-ort* se déplace et vient toujours se placer en arrière de lui.

A la tête du service général des étapes de l'armée se trouve un officier général avec le titre d'inspecteur général des étapes; il est pourvu d'un nombreux état-major dans lequel figurent en particulier, outre des officiers de chaque service, un directeur des chemins de fer, un intendant d'étapes, un médecin en chef des étapes, un directeur des télégraphes, un directeur des postes, etc. Chacun de ces fonctionnaires est responsable de la bonne exécution du service et donne des ordres aux fonctionnaires analogues des étapes. Du reste, dans chaque corps d'armée, il existe un inspecteur des étapes ayant rang de commandant de régiment, assisté d'officiers et de fonctionnaires spéciaux pour chaque service. L'inspecteur des étapes d'un corps d'armée ressort directement de l'inspecteur général des étapes, mais si son corps d'armée est appelé à agir isolément, il ne dépend plus que du général en chef et prend dès lors toute la responsabilité de sa propre ligne d'étapes.

Chaque gîte d'étapes, placé sous les ordres d'un commandant d'étapes, renferme des magasins spéciaux d'approvisionnement et de vivres; il doit, à la fois, veiller à la sécurité de la ligne et du pays environnant, maintenir le bon ordre dans les convois à leur passage, leur fournir les vivres dont ils ont besoin, recueillir les malades et concourir au service général des évacuations sanitaires.

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<sup>1</sup> Voyez C.-H. Beck : *Studien über das Etappen-wesen*. Nordlingen, 1872.



Chaque gîte d'étapes possède, dans ce but, un hôpital provisoire dont l'importance varie singulièrement suivant les localités, mais qui, en principe, doit exister partout.

Les évacuations sanitaires par voies ferrées sont placées sous la direction générale du médecin en chef des étapes de l'armée; mais pendant la campagne 1870-71, l'importance considérable de ce service avait nécessité la création de commissions spéciales d'évacuations à Wissembourg et Forbach, c'est-à-dire aux points où les trains pénétraient sur le territoire ennemi, et à Epernay qui, par sa situation centrale et le nombre des voies ferrées qui y convergent, pouvait être regardé comme lieu général de réunion pour les trains sanitaires.

Chaque train devait, en principe, arriver à vide à Wissembourg ou Forbach; la commission des évacuations, mise au courant des besoins de chaque corps d'armée, le dirigeait soit vers Epernay, soit aussi vers d'autres points spéciaux; en général, les trains gagnaient cependant Epernay, puis se mettaient en route pour aller faire leur chargement dans les hôpitaux provisoires des corps d'armée. Au retour, ils passaient de nouveau par Wissembourg ou Forbach, et recevaient des instructions qui leur indiquaient leur itinéraire en Allemagne, les hôpitaux de réserve où ils devaient déposer leurs malades. Pendant la route, ils se mettaient, dans chaque gîte d'étapes important, en communication avec le commandant et le médecin, recevaient de nouveaux malades, s'il y avait lieu, et déposaient ceux dont l'état ne permettait pas un plus long voyage; ce fait ne se produisait, il est vrai, qu'exceptionnellement.

En principe, Epernay était regardé comme point de départ général de tous les trains sanitaires; les lazarets de campagne télégraphiaient à la commission le nombre de malades qu'ils désiraient évacuer, et on leur envoyait des trains suivant les besoins; Wissembourg et Forbach avaient plutôt pour mission de répartir les malades dans les divers hôpitaux d'Allemagne. Les circonstances de la guerre et l'immense ligne qu'occupaient les armées allemandes ne permirent pas toujours de s'en tenir à ces instructions; les commissions de Wissembourg ou de Forbach devaient quelquefois envoyer directement les trains vers le théâtre de la guerre, par exemple pour l'armée du général Werder, pendant ses opérations autour de Belfort et en Bourgogne; au retour, il n'était pas non plus possible de revenir toujours par Epernay, mais aucune circonstance ne s'opposait à gagner Wissembourg ou Forbach. Après le rétablissement du pont de Kehl, quelques trains bavares ou badois passèrent néanmoins la frontière à Strasbourg.

Cela dit comme ensemble du service des évacuations, nous étudierons en particulier les principaux détails des trains sanitaires.



Pendant la guerre, 21 trains sanitaires ont transporté les malades et les blessés de France en Allemagne, à savoir : 9 trains prussiens, 1 saxon, 1 hanovrien, 1 rhénan (de Cologne), 1 hessois (de Mayence), 4 bavarois, 2 wurtembergeois, 1 badois et 1 hambourgeois. Ces trains ont été pour la plupart organisés en partie par l'administration de la guerre, en partie par les sociétés de secours ou les comités locaux; l'assistance volontaire s'est généralisée en Allemagne, mais, beaucoup mieux comprise qu'en France, elle n'a pas cherché à s'isoler de l'élément militaire et à fonctionner comme un service spécial. Le gouvernement allemand acceptait largement les services des sociétés de secours, le matériel et le personnel qu'elles lui offraient, mais en se réservant le commandement le plus absolu sur toutes choses; il a évité de la sorte les difficultés sans nombre contre lesquelles nous avons eu à réagir pendant la guerre, cette sorte de lutte ouverte entre les services sanitaires auxiliaires et les services réguliers, lutte dont le résultat est toujours au désavantage des malades.

Une fois organisé, le train sanitaire allemand passait sous les ordres de l'autorité militaire et conservait cette situation depuis le premier jour jusqu'au dernier.

Le mode d'aménagement de chaque train variait un peu suivant sa provenance; on n'avait pas suivi dans leur installation un modèle uniforme; les Bavarois, en particulier, s'étaient notablement écartés du type adopté par l'Allemagne du Nord.

Un train sanitaire prussien se composait, en général, de 27 voitures, comprenant : 20 wagons à malades, 1 wagon-salon, 1 wagon à voyageurs, 1 wagon de provisions, 1 wagon-cuisine, 2 fourgons à bagages et 1 wagon-plate-forme pour le charbon; les 20 wagons à malades, provenant des lignes hanovriennes, avaient été transformés, chacun suivant le type que nous avons décrit plus haut, mais auquel on fut amené à apporter quelques modifications imposées par l'expérience.

Au lieu de placer seize lits, on n'en avait logé que dix, répartis sur deux hauteurs, six d'un côté et quatre de l'autre; l'espace resté libre du côté où il n'y avait que quatre lits était occupé par un poêle de tôle garni de briques, destiné au chauffage du wagon, et par une petite table; entre les deux rangées de brancards, il restait un espace assez large pour que la circulation fût facile; le plancher du wagon était recouvert de toile cirée que l'on dut, pendant les grands froids, remplacer par des paillassons.

Nous empruntons à M. le docteur Wasserfuhr, médecin en chef et directeur du train sanitaire prussien n° 5, quelques observations relatives à l'aménagement de ses propres wagons, car elles s'ap-



pliquent à tous les trains prussiens établis sur un modèle à peu près identique<sup>1</sup>.

Le chauffage est indispensable dans les wagons pendant la saison rigoureuse; il offre moins de danger qu'on ne l'aurait cru au premier abord, et aucun accident n'a été signalé de ce fait; les poêles garnis de briques remplissent bien leurs indications, à condition de brûler de bon charbon et de bien disposer le système des grilles, afin d'avoir un tirage énergique. Le wagon-plate-forme sert au transport du charbon, qu'il faut toujours en approvisionnement suffisant, car sur les lignes ferrées, on ne trouve souvent que des briquettes ou de l'antracite. Sur le poêle, est placé un vase avec de l'eau qui, par son évaporation, maintient l'atmosphère ambiante dans un état suffisant d'humidité, et, de plus, permet aux gens de service de fournir les malades d'eau chaude pour les besoins de propreté ou pour les pansements.

M. Wasserfuhr s'est fort bien trouvé du système de suspension par les anneaux de gutta-percha; quatre ou cinq seulement se sont rompus dans l'espace de plusieurs mois, et cela lorsque deux malades s'assayaient à la fois sur un des brancards inférieurs; c'est là un inconvénient qu'il importe de prévenir, mais que l'on ne peut toujours éviter, car les malades se fatiguent d'être toujours couchés, et l'exiguïté du wagon ne permet pas d'y placer des sièges. Les brancards mis en usage satisfont aux indications; dans quelques trains on leur a ajouté un appui pour les pieds: c'est un mince avantage, tandis qu'ils ont l'inconvénient de rendre l'appareil moins maniable pour les déchargements et de diminuer l'intervalle, déjà fort restreint, entre les deux brancards. Ceux-ci ont toujours été garnis d'un bon matelas, de draps et de couvertures de laine *neuves*; sans doute, plus le matelas est épais, meilleur il est, mais il ne faut pas non plus tomber dans l'excès contraire, car on diminue ainsi l'espace libre, ce qui gêne considérablement les malades. Déjà, après un long usage, les courroies se relâchent, le fond du brancard se creuse, en sorte que la couche n'est plus horizontale, mais concave.

Il est bon de désigner chaque brancard par une lettre de l'alphabet, apposée sur la paroi du wagon; ceux-ci devant être distingués les uns des autres par un numérotage, les lettres conviennent mieux pour les brancards; le service des infirmiers et celui des médecins même sont singulièrement facilités par cette petite précaution.

L'éclairage du wagon était fait dans les wagons prussiens par le

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<sup>1</sup> Voyez Wasserfuhr : *Vier Monaten auf einem Sanitäts-zuge*, mémoire extrait du *Vierteljahrsschrift für öffentliche Gesundheits-pflege*, et traduit in *Annales d'hygiène et de médecine légales*, par le docteur Morache, vol. XXXVII. Paris, 1872.



moyen de deux lanternes à huile suspendues à des coins opposés de la voiture; il est nécessaire d'avoir aussi de petites lanternes à mains, ou mieux de petits bougeoirs bien disposés, car l'on est souvent obligé de panser les malades pendant la nuit, et, bien souvent même, il faut changer le train sans attendre le jour.

Dans un wagon bien aménagé, il doit se trouver un emplacement pour les sacs des hommes, leurs armes, leurs menus bagages; dans les wagons prussiens on ne trouvait qu'une planche de trois pieds de long sur un seul de large, ce qui était fort insuffisant: aussi M. Wasserfuhr propose-t-il de disposer dans les voitures des filets comme ceux que l'on trouve dans les wagons à voyageurs, d'utiliser les moindres emplacements pour y loger des planchettes, y accrocher bien solidement quelques portemanteaux; tous ces travaux doivent être faits avec le plus grand soin, car, une fois en route, on ne peut que difficilement se procurer des objets de remplacement.

Parmi les malades transportés se trouvent souvent des officiers; il est difficile de les placer dans les mêmes voitures que les soldats; dans le train prussien n° 5, on avait disposé pour cet usage un wagon spécial dans lequel, en supprimant deux ou quatre lits, on ménageait un espace suffisant pour une table de toilette et deux chaises; c'est là un luxe bien modeste, que l'on peut se permettre pour des officiers.

Les 20 wagons des trains prussiens, complètement remplis, pouvaient renfermer 196 malades couchés (19 à dix places et le wagon d'officiers à six); les trains d'autre provenance n'étaient pas tous aussi bien fournis et comprenaient, en général, quelques wagons ordinaires pour les blessés légers qui pouvaient supporter le voyage dans les conditions ordinaires. On jugera, du reste, de leur composition par la courte énumération suivante:

Les deux trains wurtembergeois, formés de longs wagons à huit roues, étaient aménagés d'après le système prussien; dans chaque voiture, quatorze ou seize brancards se trouvaient suspendus au moyen d'anneaux de gutta-percha; les trains comprenaient en outre 1 wagon-cuisine, 1 wagon d'approvisionnements, 1 fourgon à bagages et une voiture pour le personnel dirigeant. Ils pouvaient recevoir chacun 160 malades.

Le train hessois de Mayence était formé au moyen de wagons à marchandises renfermant chacun 8 brancards sur deux hauteurs, suspendus comme dans les trains prussiens; mais on y avait disposé, en outre, quelques bancs pour des blessés légers ou des convalescents. Ces wagons n'étaient pas pourvus de perrons, en sorte que la communication n'était pas facile pendant la marche. L'air et la lumière ne pénétraient que par la large porte latérale, plus ou



moins fermée au moyen d'un rideau. Outre 20 wagons de cette espèce, le train comprenait en outre 2 wagons-cuisine, 1 wagon-salon pour les médecins, 1 wagon pour les infirmiers ou infirmières, 1 wagon d'approvisionnements et 1 fourgon. Il pouvait contenir 160 malades.

Le train rhénan de Cologne se composait de 16 voitures à marchandises à 8 lits, 2 voitures à voyageurs à 12 lits, 3 wagons de troisième classe pour 32 malades voyageant assis, 1 wagon-salon, 3 voitures pour le personnel et 3 voitures pour cuisine et magasin. Il ne renfermait que 152 lits, mais pouvait transporter en outre 96 convalescents dans les voitures de troisième classe.

Le train de Mayence et celui de Cologne forment une sorte d'intermédiaire entre les wagons-ambulances système prussien et les wagons bavares. Les Prussiens, ayant à transporter un nombre considérable de blessés et de malades graves, ne destinaient leurs trains qu'aux gens assez gravement atteints pour garder le lit; ils formaient avec leurs blessés ou malades plus légers, des trains ordinaires à voyageurs, dans lesquels on ne donnait en route que fort peu de soins aux individus transportés; ils étaient nourris et pansés, s'il y avait lieu, dans les ambulances de gare, par les médecins d'étapes.

Les Bavares, au contraire, admettaient dans leurs trains sanitaires à la fois des wagons-ambulances et des wagons ordinaires. Il semble que les Prussiens aient été un peu jaloux de la bonne installation des trains bavares. Le docteur Peltzer<sup>1</sup>, dans son très-remarquable mémoire, donne deux raisons de cette différence: en premier lieu, les corps d'armée bavares auraient eu pendant la campagne beaucoup moins de blessés et de malades graves que les Prussiens; en outre, ils auraient opéré, en général, à moindre distance de leur pays, et, par suite, de leurs hôpitaux de réserve. Nous ne comprenons pas fort bien ces deux raisons, car le 1<sup>er</sup> corps bavares, sous les ordres du général Von der Thann, prit part à la campagne de la Loire, combattit à Coulmiers et eut singulièrement à souffrir dans sa retraite et dans son retour offensif: le 11 décembre, il dut même être envoyé en entier à Orléans, pour s'y refaire; à cette époque l'effectif présent étant de 19,611 hommes, le nombre des malades et des blessés s'élevait à 10,290! Quant au 2<sup>e</sup> corps (von Hartmann), après avoir participé aux batailles de Wissembourg, Wœrth et Sedan, où il éprouva des pertes considérables, il fut appelé autour de Paris et fut engagé dans plusieurs combats, notamment aux combats du Plessis-Piquet et du Petit-Bicêtre<sup>2</sup>.

<sup>1</sup> Peltzer: *Die Deutschen Sanitätszüge und der Dienst als Etappen-arzt*. Berlin, 1872, pages 18 et suivantes.

<sup>2</sup> Voyez Heilmann, *Antheil des 2 Bayerischen Armee-corps an dem Feldzuge von*



Il est possible qu'en effet ces deux corps n'aient pas été engagés en France aussi loin que les corps prussiens, mais nous doutons fort qu'il n'aient eu, ainsi que semble le dire M. le docteur Peltzer, qu'une proportion inférieure de blessés. C'est là, du reste, une discussion dans laquelle nous n'avons pas à intervenir.

Toujours est-il que les trains sanitaires bavarois étaient mieux organisés que les trains prussiens. Leurs aménagements et leur fonctionnement se trouvent décrits avec détail dans un intéressant mémoire de M. Reinhold Hirschberg <sup>1</sup>, accompagné de douze magnifiques planches, qui font de cet ouvrage l'un des travaux les plus complets sur la question des trains sanitaires.

Après quelques tâtonnements, chaque train bavarois fut composé de : 13 voitures à voyageurs contenant chacune 5 lits, disposés comme nous le disons plus bas; 7 voitures à voyageurs de deuxième et troisième classes chauffés à la vapeur; 1 wagon disponible pour parer aux éventualités de la route; 1 wagon pour le personnel dirigeant; 6 wagons d'approvisionnements, de cuisine, de matériel, dont l'un comprenait l'appareil de chauffage à la vapeur; 1 wagon-plateforme pour le charbon et le bois, en somme : 29 voitures.

Les wagons à voyageurs des lignes bavaroises sont assez courts, en sorte que l'on ne put y placer que cinq lits, dont trois d'un côté et deux de l'autre, laissant alors un espace libre pour le poêle et quelques ustensiles. Les lits n'étaient point suspendus, mais leurs pieds reposaient sur des ressorts en acier, assez semblables à ceux des voitures, ce qui donnait une suspension bien préférable à celle des wagons prussiens; de chaque côté du wagon s'ouvraient cinq belles fenêtres garnies de rideaux, et les wagons communiquaient entre eux au moyen de plates-formes comme dans les wagons prussiens. Nous n'insisterons point plus longuement sur ces installations, véritablement très-remarquables, et renvoyons à l'ouvrage et surtout aux planches de M. Reinhold Hirschberg, qui, mieux que toute description, feront ressortir le confortable et presque le luxe de ces wagons-ambulances bavarois. Quant aux ressorts des lits, nous en parlerons plus loin avec détail, en proposant leur adoption, avec quelques modifications, pour les wagons-ambulances français.

Les wagons bavarois n'avaient pas tous reçu une transformation aussi complète; on se servit aussi de fourgons à bagages ne contenant que quatre lits, et, dans quelques autres, on adopta le

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1870-71, et docteur Seggel : *Krankenbewegung bei dem 1 Bayerischen armee-corps*, travaux analysés dans la *Revue militaire de l'étranger*, n° 30, 1872.

<sup>1</sup> Voyez Reinhold Hirschberg, *Die Bayerischen Spitalzüge im Deutsch-französischen Kriege*. München, 1872.



système de suspension prussien. Les quatre trains bava-rois ont transporté en moyenne, à chaque voyage, 250 malades graves et légers, mais accidentellement jusqu'à 566 et même 870 (train n° 2, envoyé à Haguenau après Reischoffen).

Le train badois était organisé à peu près comme les trains bava-rois; il comprenait 2 wagons pour officiers à 8 lits, 5 à 14 et 7 à 8 lits, 2 wagons à voyageurs à 64 places et 4 de deuxième classe à 30 places, enfin 1 wagon-salon, 1 wagon pour le personnel, 1 wa-gon-cuisine et 1 fourgon. Les wagons pour malades couchés, aussi bien que pour malades assis, avaient été empruntés aux lignes wurtembergeoises et communiquaient tous par des plates-formes. Le train pouvait donc contenir environ 140 malades couchés et 220 à 240 assis, en supposant que toutes les places fussent occu-pées, ce qui n'est guère praticable.

Le train saxon renfermait 19 voitures à marchandises transfor-mées pour 8 lits, 3 voitures à voyageurs de 4<sup>e</sup> classe à 10 lits, d'après le système prussien, 1 wagon-cuisine, 1 wagon-magasin, 1 fourgon à bagages et une plate-forme pour le charbon. Il pouvait contenir en tout 182 malades couchés et présentait le défaut de n'avoir pas de wagon spécial pour le personnel médical.

Le train sanitaire hambourgeois forme, pour ainsi dire, une classe à part, en ce qu'il n'était pas permanent; à chaque voyage il a été pour ainsi dire désarmé; le personnel revenait sur le théâ-tre de la guerre avec le matériel emballé dans des wagons à mar-chandises; puis, en quelques heures, il fallait procéder à un équi-pement complet, réunir des wagons, disposer le matériel, en un mot, prendre des dispositions qui ne pouvaient que perdre à être ainsi faites à la hâte. On agissait de la sorte pour ne pas laisser sans emploi un nombre assez considérable de wagons, tout au moins pendant le retour à vide; mais, dans les trains prussiens, il n'en était pas ainsi, et, tout au contraire, en revenant d'Allemagne en France, chaque train sanitaire arrivait chargé de matériel et d'ap-provisionnements pour la commission des évacuations à Epernay. Le train hambourgeois a fait, en tout, cinq voyages dans ces con-ditions; son matériel lui permettait de transformer 20 voitures et de recevoir 240 malades.

En résumé, les 21 trains sanitaires allemands renfermaient 3,724 places disponibles. Le prix de revient d'un train prussien, c'est-à-dire la somme nécessaire pour la transformation du matériel des chemins de fer, s'élevait à 2,900 thalers (10,875 francs).

En dehors des wagons spécialement destinés aux malades, les trains allemands en comprenaient, comme on l'a vu, un certain nombre d'autres destinés au personnel et au transport du matériel; nous en dirons quelques mots, car ils ont également leur importance.



Dans les trains prussiens, les objets d'approvisionnements se trouvaient logés dans deux fourgons qui ne communiquaient pas directement avec les autres wagons, du moins pendant la marche. Les provisions de vivres, les liquides (bière, vin, eau de Seltz, etc.), se sont assez souvent congelées par suite de la température très-basse pendant une partie de l'hiver 1870-71; aussi devint-il nécessaire de placer certains de ces objets soit dans les voitures de malades, soit dans le wagon-cuisine. Dans tous les cas, les objets nécessaires à la consommation de deux ou trois jours devaient être mis à portée; on les emmagasinait alors dans un wagon destiné à loger l'économe et quelques médecins de grade inférieur. Le personnel médical supérieur, le médecin conducteur du train, avaient à leur disposition un wagon-salon qui, primitivement, monté avec un certain luxe, ne répondait que fort mal au service spécial auquel il était destiné; le chauffage s'y trouvait fort difficile, l'aération beaucoup trop vive, à cause des nombreuses fenêtres dont ses parois étaient percées. Les habitants de cette voiture ne l'ont rendue habitable qu'après de nombreuses transformations.

Dans les trains bavarois, la disposition des wagons de matériel paraît avoir été mieux comprise; ils étaient au nombre de six, chacun d'eux ayant une destination spéciale; l'un renfermait les provisions de vivres liquides, un autre les gros objets, un troisième les vêtements, etc. L'intérieur des voitures avait été divisé en compartiments et armoires, les parois étaient garnies de tablettes, en sorte que chaque objet trouvait sa place naturelle et que les mouvements de trépidation n'amenaient aucun désordre ni aucun accident.

L'installation des wagons-cuisines paraît ne pas avoir été complètement satisfaisante dans les trains prussiens; les fourneaux étaient trop petits, les casseroles ou autres objets de cuisine en nombre insuffisant; pour préparer trois repas par jour pour 200 à 220 personnes, malades et personnel de service, il aurait fallu cuisiner à peu près nuit et jour; aussi devint-il nécessaire de réserver la viande fraîche, qui exige une plus longue cuisson, pour une partie seulement du personnel et des malades, et de nourrir tous les autres avec des vivres-conserves, que l'on peut chauffer beaucoup plus vite. Une autre difficulté très-sérieuse provient de la trépidation du train et des chocs incessants qui tendent à projeter les liquides hors des vases qui les renferment. Il est de toute nécessité d'avoir, pour le service de cuisine, un matériel spécial, construit en vue de ces difficultés, d'adapter aux ustensiles des couvercles vissés ou retenus par des écrous. Peut-être pourrait-on adopter avec avantage, pour les fourneaux de cuisine, le système de double suspension, comme celui des lampes à bord des navires.



Les trains bavarois possédaient un wagon spécial avec water-closets, tandis que dans les trains prussiens les malades n'avaient à leur disposition que des baises plus ou moins bien construites et mobiles. La décence et l'hygiène exigent que les malades puissent avoir sinon un wagon particulier, au moins des cabinets; une pareille installation doit trouver place dans les nouveaux trains sanitaires.

Il est fort important de disposer le train suivant un ordre très-méthodique; les chef des trains allemands ne se sont pas toujours accordés sur ce sujet; il est évident qu'il faut placer en tête, ou du moins dans la première partie du train, les wagons destinés aux malades graves; d'un autre côté, pour la facilité du service, il est désirable que les communications soient faciles d'un bout à l'autre de la section du train réservée aux malades, et cependant le wagon-cuisine ne saurait être relégué tout à fait à l'extrémité postérieure, ce qui nuirait considérablement à la distribution rapide des aliments. Dans les trains prussiens, le wagon destiné aux médecins supérieurs se trouvait tout à fait en tête, séparé de la locomotive par le wagon-plate-forme à charbon; venaient ensuite les vingt wagons à malades, séparés en deux séries par le wagon-cuisine; enfin, tout à la gauche, le train se terminait par les wagons d'approvisionnements.

Les trains bavarois avaient adopté l'ordre suivant, nécessité par leur composition en wagons de malades et wagons à voyageurs : un wagon d'approvisionnements, douze wagons à malades communiquant, le wagon à water-closets, le wagon-cuisine, deux wagons pour le personnel médical, le directeur du train et les gens de service, un wagon-dépôt, le wagon de réserve, le wagon avec l'appareil de chauffage à la vapeur, les wagons à voyageurs pour les malades assis, enfin un wagon-magasin. Cet aménagement avait l'avantage de placer le personnel et la cuisine au centre du train, à égale distance, par conséquent, des deux groupes de malades qu'il fallait desservir. Du reste, le service des malades assis, dans les wagons à voyageurs, ne pouvait s'effectuer que pendant les arrêts, toujours assez courts.

Les médecins prussiens se sont plaints d'un abus qui s'est, paraît-il, plusieurs fois répété, « celui d'attacher au train sanitaire des wagons chargés de matériel et de troupes, et quelquefois aussi des voitures renfermant des marchandises particulières que l'on cherchait à dissimuler en plaçant sur le wagon l'étiquette mensongère : *Pour l'armée.* » Ces manœuvres ont pour inconvénient de ralentir considérablement la marche du train; or, il y a là un double inconvénient; s'il est à vide, on retarde singulièrement son arrivée aux ambulances, où il est impatiemment attendu; s'il revient rempli de malades, on expose ces derniers à un voyage pro-



longé. Généralement, au retour en France, les wagons transportaient du matériel pour la commission d'Épernay ou pour le service des hôpitaux, parfois même du matériel de guerre; ces transports peuvent se faire sans inconvénients, à condition toutefois que les colis, ainsi ajoutés au train, ne puissent se confondre avec ceux appartenant au train lui-même, et que la réquisition soit régulièrement adressée par l'autorité militaire, sans quoi l'on verrait naître, ainsi que cela est arrivé du reste, de singuliers abus.

A la tête du personnel se trouvait, dans les trains prussiens, un médecin, comme chef du service médical aussi bien que comme conducteur du train; d'autres trains, les Bavares, par exemple, étaient commandés par des officiers; d'autres étaient placés sous les ordres de chefs pris dans différentes classes de la société, des princes, des chambellans, des propriétaires, etc. Sans vouloir, en aucune façon, mettre en doute l'abnégation, le zèle et le patriotisme de ces personnages, M. Wasserfuhr<sup>1</sup> approuve le ministère de la guerre prussien d'avoir choisi des médecins pour les placer à la tête des trains sanitaires, et nous reproduisons ses arguments, car ils sont également vrais partout :

« Il est temps que les médecins réclament énergiquement, et comme un droit, la direction de tout établissement où se trouvent des malades, et cela au même titre qu'un colonel commande un régiment. Dans un établissement sanitaire, tout doit viser à un seul but, la guérison des malades, et tous les services, même celui de la discipline du personnel valide ou malade, doivent être soumis à la même autorité. Cette concentration du pouvoir, dans une seule main, est surtout nécessaire dans un train sanitaire; seul, le médecin peut désigner les malades transportables, les distribuer dans les lits et les wagons, en disposer en route s'il est nécessaire. Seul aussi, il doit être juge de la capacité de ses auxiliaires et leur donner des ordres pour le service. A côté de ces importantes fonctions, qui se rapportent aux malades eux-mêmes, la discipline, la direction du matériel, les achats ne viennent que sur un second plan : ce sont les moyens auxiliaires pour atteindre le but principal. Si l'on donne le commandement à un officier ou à un administrateur, les rôles sont renversés, l'auxiliaire devient le principal. En guerre, partout où il s'agit de diriger des masses d'hommes, valides ou malades, à travers des difficultés que l'on ne peut prévoir, puisqu'elles changent à chaque instant, si l'on veut arriver à un but, il est de toute nécessité de confier le commandement à un seul chef, en possession de l'ensemble des connaissances techniques qui en font trouver la voie.

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<sup>1</sup> Voyez Wasserfuhr, *loc. cit.*



Or, la tâche d'un train sanitaire n'est pas seulement de transporter des malades et des blessés, mais de les transporter avec les précautions qu'exigent leurs blessures et leur état de souffrance, de conserver leur vie et de rétablir leur santé, autant que cela dépend de nous. La science et l'expérience du médecin sont indispensables pour atteindre ces résultats. Ce n'est pas tout; en guerre, le médecin a affaire à une seule classe de la société, aux militaires; les officiers ou soldats malades ne cessent pas d'appartenir à l'armée; leur réception dans un train sanitaire, leur traitement pendant le voyage, leur arrivée dans un hôpital, doivent se faire en accord avec les règlements militaires que le médecin connaît. D'un autre côté, des rapports, des renseignements à prendre, des réquisitions à faire, tous les genres de service, enfin, le mettent en rapport avec des officiers, des médecins, des fonctionnaires de tous grades. Il devient le supérieur de tout un personnel qui, aujourd'hui déjà, appartient en partie à l'armée et au-dessus duquel il doit avoir un grade fixe. Le médecin en chef doit donc appartenir à l'armée active ou de réserve, il doit avoir un caractère et un rang militaires, afin de tenir sa place avec ses supérieurs comme avec ses inférieurs. »

Outre le médecin en chef, les trains prussiens comptaient, comme personnel, un ou deux *assistent-arzte* (aides-majors) et autant d'*unter-arzte* (sous-aides) de l'armée, dix *heigehülffen* (sous-officiers), et une vingtaine d'infirmiers. Ces auxiliaires, pris un peu partout, fournis souvent par les sociétés de secours et sans contrôle suffisant, étaient assez souvent au-dessous de leur mission, n'avaient aucune connaissance des soins à donner aux malades, et ne présentaient pas toujours la plus scrupuleuse honnêteté; les médecins s'en sont assez souvent plaints très-amèrement et réclament que, à l'avenir, le personnel des trains sanitaires soit organisé en temps de paix. M. Wasserfuhr demande, en particulier, la création de compagnies sanitaires de réserve, prises dans les cadres des bataillons de réserve (*ersatz-batallionen*), et exercées pendant quelques semaines à un service spécial; il entre, à ce sujet, dans des détails que nous n'avons pas à reproduire, quoique nous pourrions y puiser de précieux enseignements pour des créations analogues dans l'armée française.

Le personnel du train wurtembergeois était plus considérable que celui des trains prussiens; il consistait en : 1 médecin-directeur du train, 2 médecins assistants, 4 aides de santé (*heigehülffen*) de 1<sup>re</sup> classe, 1 pharmacien, 12 brancardiers, 12 infirmières, 2 cuisinières et un employé aux provisions. Ce personnel variait un peu à chaque voyage. Les trains bavarois comprenaient un nombre variable d'infirmiers et à leur tête 1 capitaine, 4 médecins, 6 sœurs de charité, 1 caporal et 3 soldats.



Les médecins auxquels était confiée la direction du train se plaignent beaucoup du nombre assez considérable de gens qui, sous prétexte d'être utiles aux malades, se faisaient admettre à un titre quelconque dans les trains sanitaires, tandis que, en réalité, ils n'y venaient que pour faire une excursion sur le théâtre de la guerre, souvent pour s'y livrer à des exploits peu honorables. C'est là un aveu qui a bien son prix, et, sans aucun doute, les médecins allemands n'expriment pas, à ce sujet, leurs pensées tout entières. La présence de femmes en particulier, dit M. Wasserfuhr, est une véritable difficulté. « J'apprécie, dit-il, la valeur d'infirmières dévouées, femmes d'éducation et expérimentées; elles peuvent rendre de grands services *chez elles*, dans les hôpitaux de réserve. Mais quant à ces personnes pourvues de laissez-passer, portant la croix rouge, mais fort ignorantes des soins à donner aux malades, qu'un vague désir d'aventures pousse sur le théâtre de la guerre, elles sont une véritable plaie pour les médecins, les officiers et les malades. »

Ainsi organisés en matériel et en personnel, les trains sanitaires allemands constituaient de véritables hôpitaux roulants, dans lesquels les malades pouvaient être aussi bien, sinon mieux soignés que dans les ambulances et les hôpitaux provisoires où ils avaient été tout d'abord accueillis.

Le service médical leur était assuré par la présence des médecins qui, après quelques tâtonnements, avaient réglé leur service d'une façon parfaitement méthodique. Aussitôt après le départ du train chargé de malades, le médecin en chef, assisté de ses aides, faisait une visite générale, prescrivait s'il y avait lieu des changements de place pour les blessés que l'on n'aurait pas couchés dans une situation convenable pour leurs blessures, faisait panser ou pansait lui-même ceux qui ne l'avaient pas été le jour même, et désignait à chaque aide les malades dont il fallait s'occuper spécialement. Les jours suivants, immédiatement après le premier déjeuner, les *assistent-arzte* faisaient la visite, chacun dans leur section, donnaient les prescriptions, pansaient les blessés; le médecin en chef passait ensuite, se faisait rendre compte de chaque malade et pratiquait les pansements importants.

Aussitôt après la visite, les gens de service se livraient à un nettoyage des wagons, des ustensiles, puis dans l'après-midi les *assistent-arzte* faisaient une seconde visite après laquelle le médecin en chef passait lui-même dans les wagons pour inspecter le personnel, le matériel et donner un second coup d'œil aux malades.

Les objets de pansement ne faisaient point défaut dans les trains prussiens; ils étaient pourvus d'appareils pour la préparation des bandages plâtrés dont, comme on le sait, la chirurgie de guerre allemande fait un grand usage, quoique, pendant la dernière cam-



pagne, ils ne paraissent pas avoir toujours donné de bons résultats. Sur les trains, il est tout à fait impossible de les appliquer, et plusieurs fois l'on a dû en enlever qui menaçaient de produire des accidents de compression.

Le service pharmaceutique n'a pas une bien grande importance sur un train sanitaire; là, comme dans les ambulances, il ne s'agit pas de préparer des médicaments, mais simplement de faire usage de quelques substances bien choisies, de solutions titrées que l'on dose par conséquent très-rapidement; aussi la pharmacie des trains sanitaires prussiens était-elle tout entière contenue dans deux boîtes placées dans le wagon du médecin en chef; leur contenu suffisait amplement aux besoins, et le docteur Wasserfuhr ne signale qu'une omission qui est du reste inconcevable, celle du sulfate de quinine. Le médecin en chef, ou à défaut un des *assistent-ärzte*, faisait après la visite la distribution des médicaments. Dans le personnel des trains sanitaires, il ne faut admettre que les gens réellement utiles, aussi ne leur avait-on pas adjoint de pharmacien; les trains bavares, plus largement fournis en personnel, en avaient un, au contraire; mais pour tous ceux qui ont pratiqué la chirurgie ou la médecine de guerre, il y a lieu de se demander quels services pouvait rendre ce fonctionnaire, dont la place est bien plus marquée dans les hôpitaux de réserve, où ses services sont alors incontestables.

Au point de vue de l'alimentation, l'administration de la guerre avait amplement doté ses trains sanitaires; on peut en juger par l'énumération des objets fournis réglementairement : café, cacao, farines et légumes secs de toute nature, boîtes de conserve de viande et de légumes, pruneaux, confitures, biscuits de mer et biscuits anglais, citron, extrait de viande, viande conservée, etc. Comme boissons, l'on y trouvait de l'eau gazeuse, de la bière, du vin rouge, du vin du Cap et de Porto, du cognac et du rhum, du lait conservé. Tous ces objets étaient, à l'exception de certaines conserves de viande et de l'extrait Liebig, de première qualité; le lait conservé constituait en particulier une précieuse ressource. En outre de ces provisions, le médecin en chef recevait à Epernay ou se procurait par voies d'achats et de réquisitions certains aliments frais, tels que viande, pain, œufs, saucisson de pois, etc.

Chaque soir, le cuisinier venait prendre les ordres du médecin en chef pour le repas du matin, et, dans la journée, pour celui du soir. Les repas consistaient, pour les malades, en un premier déjeuner avec soupe à la farine ou au pain, ou café au lait avec pain et beurre; quelques malades avaient un second déjeuner avec bouillon aux œufs ou jambon et vin du Cap. Vers midi ou une heure venait le principal repas, composé de potage, un plat de viande et de légumes et un petit dessert; enfin, le soir, on faisait une distribu-



tion générale de soupe grasse ou maigre, de pain, de beurre et de jambon. Chaque malade recevait, en outre, du vin ou de la bière que l'on préférait en général, mais qu'il était parfois très-difficile de se procurer en France. Les officiers recevaient quelques aliments spéciaux et des vins fins; les distributions de tabac et de cigares faisaient également partie des allocations régulières.

Le personnel de service devait primitivement prendre ses vivres dans les dépôts créés dans tous les gîtes d'étapes sur les voies ferrées; mais comme, dans la pratique, ce système n'était pas très-applicable, on en vint à nourrir tout le monde à la cuisine du train, sauf pendant les arrêts prolongés en Allemagne.

On voit, par tout ce qui précède, que l'on avait, avec raison, apporté les plus grands soins à assurer aux malades une alimentation réparatrice et appropriée à leur état. Aussi cette période de voyage était-elle pour eux une période de recomfort physique et moral tout à la fois. Chaque tour de roue les rapprochait du pays, et cette influence stimulante était bien préférable au meilleur traitement pharmaceutique.

Dans les divers travaux publiés jusqu'à ce jour, les médecins allemands entrent dans de grands détails sur la catégorie des individus que les trains sanitaires doivent recevoir; elle dépend évidemment de l'installation particulière de chaque train; mais étant donné qu'il est destiné uniquement aux cas graves, on doit d'abord en écarter tous ceux dont la vie est menacée prochainement ou qui exigent une opération prochaine, ceux enfin dont le pansement nécessite des appareils très-complicés ou un trop grand nombre d'assistants. Les pansements étaient difficiles dans les voitures un peu étroites; les médecins allemands le disent très-nettement, il ne faut point espérer y faire une chirurgie très-active. Ils ont également, autant que possible, évité de recevoir les maladies qui engendrent un *contagium* rapidement généralisable, telles que typhus, variole; par contre, ils acceptaient fort bien les cas de dysenterie ou de fièvre typhoïde, pour lesquels le voyage même, le changement d'air sont une chance de guérison; toutefois, ils plaçaient ces derniers dans des wagons spéciaux. Ils se plaignent que, dans maintes circonstances, leurs collègues des lazarets de campagne leur ont glissé dans le nombre des individus qu'ils auraient dû garder, tels que des amputés récents, des cas de fractures graves non encore placées dans des appareils, des varioleux et même des aliénés. Ce sont là des incidents qu'une surveillance même attentive ne peut pas toujours éviter.

Néanmoins, la mortalité paraît avoir été des plus minimes dans les trains sanitaires; c'est là un fait que les Américains avaient déjà signalé; il s'explique en partie par le choix judicieux que l'on fait des malades à évacuer, mais aussi par les conditions favorables



dans lesquelles les malades se trouvent à *bord* du train, par le stimulant que donne la joie du retour, enfin par la rapidité du voyage. Nous n'avons point encore trouvé de statistique bien précise sur ce point, si ce n'est pour le train sanitaire n° 5, qui, sur 1200 individus transportés en cinq voyages, n'eut à enregistrer qu'un seul décès.

Le nombre total des blessés ou malades transportés de France en Allemagne n'est pas encore publié. Le docteur Peltzer, médecin des étapes à Nancy, nous indique seulement que, du 23 août 1870 au 5 mai 1871, il en est passé 144,290 par Nancy, dont 127,582 par des trains ordinaires et 17,358 en 83 voyages de trains sanitaires. Remarquons que les trains ne passaient pas tous par Nancy, mais souvent par Forbach ou par la voie Mulhouse-Strasbourg-Kehl; d'autres ont aussi obtenu passage au travers du Luxembourg ou de la Belgique.

Les quatre trains bavares ont accompli pour leur part 39 voyages et transporté 10,800 malades ou blessés.

La durée des voyages variait essentiellement suivant les circonstances; elle dépendait moins de la distance à franchir que de l'encombrement quelquefois excessif des voies; en général, les séjours au point de chargement en France duraient fort peu, les lazarets, prévenus télégraphiquement de l'heure d'arrivée, tenaient les malades prêts, et, en quelques heures, le train était en état de partir. Un nouvel arrêt se produisait à Epernay pour le chargement du matériel, l'échange des objets de literie détériorés et salis; en Allemagne, il était besoin de quelques jours pour procéder aux petites réparations et donner au personnel le temps de prendre quelque repos, car, pendant toute la durée du voyage de retour, les infirmiers étaient presque continuellement de service et n'avaient pas d'endroit particulier pour se reposer.

Pour tous ces détails, pour la direction de services importants et multipliés, pour faire face à tous les rapports écrits, verbaux ou télégraphiques avec les commissions d'évacuation, avec les médecins des étapes et les compagnies de chemin de fer, les médecins-directeurs d'un train sanitaire devaient posséder une énergie morale et même une vigueur physique peu communes. Ils étaient soutenus par la conscience du devoir qu'ils accomplissaient, par la certitude des bienfaits énormes qu'en ressentaient les malades. Aussi lorsque, la paix faite, ces médecins ont pu retracer leurs souvenirs et jeter un coup d'œil sur cette période de six mois passés dans une activité fébrile, se sentent-ils pénétrés de l'importance du rôle qu'ont joué pendant la campagne les trains sanitaires allemands. Cette opinion est partagée par l'armée et la nation tout entière; nous en retrouvons la preuve dans les nombreuses publications qui paraissent encore en



Allemagne et que des médecins seuls n'ont pas écrites, mais aussi des officiers et des fonctionnaires de toutes classes. Les trains sanitaires sont devenus populaires en Allemagne, et c'est à juste titre; nous pouvons, nous les ennemis, les apprécier également, car ils sont une manifestation des sentiments de charité, d'humanité que nous devons placer au-dessus des haines nationales, au-dessus même de la douleur sacrée que nous éprouvons tous.

La guerre de 1870-71 a surpris l'administration française sans qu'elle eût organisé un service de transport par voies ferrées pour ses malades et ses blessés futurs; ce fut seulement le 19 juillet 1870 qu'un fonctionnaire de l'intendance fut désigné pour s'entendre pratiquement avec la compagnie de l'Est au sujet de l'aménagement des wagons<sup>1</sup>; les ingénieurs de cette compagnie déployèrent immédiatement une grande activité, et, grâce aux ressources dont disposaient leurs ateliers de Montigny près Metz, nous pouvions espérer avoir bientôt un matériel important; malheureusement les circonstances de la guerre immobilisèrent bientôt ce matériel, qui fut employé comme ambulances-annexes pendant l'investissement de Metz. Privées dès lors de toute ressource spéciale, les évacuations ne purent s'exécuter qu'avec une extrême difficulté et dans des conditions que les événements de cette malheureuse guerre peuvent faire comprendre. Après Sedan, en particulier, l'autorité allemande, tout en retenant les médecins, les officiers d'administration et les infirmiers, laissa déposer à la gare de Charleville plusieurs milliers de malades et de blessés que l'on dirigea tant bien que mal sur les places du Nord et de l'Ouest. Ils durent être transportés dans les wagons de la compagnie du Nord, mais sans aucune installation spéciale, sans brancards, sans matériel et presque sans médecins; car l'on n'avait pour ce service que quelques élèves des hôpitaux de Paris, accourus à la hâte, pleins de zèle, mais sans aucun doute fort peu au courant du service que les circonstances leur imposaient.

Plus tard, sur la Loire, après nos différents combats, en particulier après la retraite d'Orléans, les blessés et les malades encombraient les villes, les villages et les routes, sans que l'on pût disposer de moyens suffisants pour les enlever; ils tombèrent à peu près tous au pouvoir de l'ennemi, qui bientôt dédaigna même de les faire prisonniers ou du moins n'en fit pas autant qu'il aurait pu. Ce sont là de tristes souvenirs, que ressentent vivement tous ceux qui en ont eu le triste spectacle; nous n'y insisterons pas et n'y voulons

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<sup>1</sup> Voyez Ch. Robert, intendant général : *Difficultés que rencontre en France l'administration des grandes armées, et moyens pratiques d'y remédier*. Paris, 1871, page 46. — *Journal des Sciences militaires* livraison de juin 1872, p. 161.



puiser qu'un enseignement, celui de ne pas retomber dans les mêmes fautes, et, dans nos guerres futures, d'avoir un matériel, une organisation d'ambulances et d'évacuations à la hauteur des besoins. Cependant le gouvernement avait à cœur de parer, dans la mesure du possible, à cette pénible situation : le 25 décembre 1870, une circulaire du Ministre de l'intérieur et de la guerre prescrivait de créer, sur les lignes ferrées, des ambulances provisoires pouvant contenir 1,000 à 1,200 blessés; elle désignait dans chaque réseau les points où ces ambulances provisoires devaient être tout d'abord organisées. Du reste, sans attendre de nouveaux ordres, l'administration devait établir des ambulances, distantes au plus de 60 kilomètres, en arrière de tous les points de concentration d'une armée; les ambulances, pourvues d'un matériel élémentaire, mais suffisant, de moyens de transport, de personnel médical et administratif, avaient pour but de recevoir les malades et les blessés évacués par les ambulances des corps d'armée. La circulaire du 25 décembre entraînait dans des détails fort précis sur la composition des trains d'évacuation, la catégorie de malades à y placer, le personnel médical qui les devait accompagner. Elle annonçait la création d'un service spécial d'inspection que vinrent organiser les arrêtés des 10 et 12 janvier 1871.

Sept lignes d'évacuation, disposées de façon à desservir les armées de la Loire, de l'Est et les différents corps en campagne, se trouvaient constituées et placées chacune sous l'inspection et la direction d'un médecin inspecteur des évacuations, commissionné à cet effet par le ministre et placé sous son autorité immédiate. Ces lignes étaient les suivantes :

- 1<sup>re</sup> ligne. Caen et Cherbourg à Brest, par Le Mans.
- 2<sup>e</sup> — Vendôme et Quimper à La Rochelle, par Tours et Angers.
- 3<sup>e</sup> — Blois à Bayonne, par Poitiers et Bordeaux.
- 4<sup>e</sup> — Orléans à Perpignan et Tarbes, par Agen et Toulouse.
- 5<sup>e</sup> — Gien et Nevers à Nîmes et Cette, par Clermont-Ferrand.
- 6<sup>e</sup> — Dijon à Besançon, Marseille et Nice.
- 7<sup>e</sup> — Réseau du Nord et de la Seine-Inférieure.

Les circulaires des 10 et 12 janvier 1871<sup>1</sup> réglaient complètement le service des évacuations sur ces lignes, les devoirs des médecins-inspecteurs des évacuations et des sous-inspecteurs; dans chacun des points importants de leur réseau, points que la circu-

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<sup>1</sup> Voyez *Journal militaire officiel* 1871, § 158 et 176, et *Annales d'hygiène publique et de médecine légale*, vol. XXXVI, page 190. Paris, 1871.



laire du 10 janvier énumérait en partie, ces fonctionnaires devaient, de concert avec les préfets et les autorités militaires, faire installer des ambulances de gare et les pourvoir d'un matériel et d'un personnel suffisants. En tête de chaque ligne d'évacuation, un personnel médical désigné à cet effet avait pour mission d'examiner les individus proposés pour être évacués, les classer par catégories et les diriger vers la ligne en faisant accompagner chaque train d'une feuille mentionnant le nombre et la gravité des malades; un médecin et plusieurs infirmiers, placés dans le train, assuraient, autant qu'il était possible, le service de secours pendant la route. — Prévenues télégraphiquement, les ambulances de gare préparaient pour l'arrivée du train leurs moyens de transport, les objets de pansement, et, suivant les circonstances, quelques aliments et des boissons. Les malades, rapidement examinés aussitôt leur arrivée, étaient transportés dans les hôpitaux de la ville, ou séjournaient à l'ambulance de gare, ou bien enfin étaient dirigés sur un point plus éloigné.

Lorsque le train ne devait que passer par une gare, sans y séjourner, l'ambulance se contentait de donner des vivres, renouveler les pansements s'il y avait lieu et recueillir les malades dont l'état était trop grave pour leur permettre de continuer la route. — Il était recommandé de ne pas évacuer à grande distance : 1° les malades gravement atteints; 2° les individus atteints d'affections contagieuses; 3° ceux qui au bout de 10 à 15 jours devaient être en état de rejoindre leurs corps.

Désigné pour organiser le nouveau service comme inspecteur de la 1<sup>re</sup> ligne d'évacuations, l'auteur de cette étude a pu juger par lui-même des immenses avantages que ces créations auraient certainement donnés; elles étaient en quelque sorte l'imitation des services d'étapes sur chemins de fer dans l'armée allemande; malheureusement elles arrivaient trop tard, et bientôt l'armistice et la paix définitive les firent disparaître. Néanmoins sur la 1<sup>re</sup> ligne d'évacuations, qui avait une importance considérable, car elle desservait l'armée du général Chanzy et plus tard celle qui se constituait dans la presqu'île du Cotentin, on était arrivé à créer, à organiser d'une façon complète les ambulances de gare, à régler leur service, à établir un fonctionnement très-régulier; ces résultats étaient dus aux mesures aussi rapides qu'énergiques que surent prendre les autorités militaires et administratives de ces différents points, au bon vouloir et au zèle des médecins civils qui, faute de médecins militaires, durent être requis pour les ambulances de gare. A Rennes, en particulier, où pendant plus d'un mois passaient journellement deux ou trois trains de malades, nul encombrement ne s'est produit et tous ont reçu les secours que leur état réclamait.



Cette organisation des évacuations ne comprenait pas la transformation des wagons et leur adaptation au service sanitaire, mais il faut tenir compte des circonstances, se souvenir qu'à cette époque les heures valaient des semaines, que notre matériel était en grande partie immobilisé à Paris, qu'enfin l'on pouvait à peine suffire à l'indication la plus pressante, celle du transport des soldats et du matériel dirigés sur l'armée.

#### § IV.

##### PROPOSITION D'ORGANISATION DU SERVICE DES ÉVACUATIONS PAR VOIES FERRÉES DANS L'ARMÉE FRANÇAISE.

Il est un enseignement que nous devons tous retirer de la guerre de 1870-71, principe presque banal à force d'être vrai, mais que nous avons peut-être trop oublié : l'armée est faite pour la guerre, la période de paix ne doit être regardée au point de vue militaire que comme une préparation à la guerre. L'armée, même sur le pied de paix, doit renfermer, tous constitués, les divers services qui lui sont nécessaires pendant la guerre. Les services de secours ne font point exception à cette règle, et nous avons pu voir, pendant la guerre, combien notre organisation était, à ce point de vue, au-dessous du rôle qu'elle devait jouer, au-dessous de la mission qui lui est dévolue. Nous devons donc, dès à présent, prendre des dispositions telles que nous ne soyons pas pris encore une fois au dépourvu. Sans vouloir aborder ici d'une façon générale l'étude, cependant si intéressante, du service médical aux armées en temps de guerre, nous nous bornerons à la question que nous n'avons pas abandonnée un instant, celle du transport des malades et blessés par les voies ferrées.

Tout d'abord il y a lieu de se préoccuper du matériel ; peut-être le gouvernement pourrait-il demander aux compagnies d'en construire un spécial, analogue à celui que possèdent les Prussiens sur les lignes hanovriennes ou à celui des chemins de fer suisses ; mais l'on doit craindre de voir se produire une objection technique que l'on nous a déjà faite : celle de ne pouvoir, sur nos lignes, dépasser sensiblement les dimensions déjà existantes. On affirme qu'en raison des courbes à court rayon, très-nombreuses sur nos voies, et des vitesses de 70 à 80 kilomètres que les wagons doivent pouvoir fournir, il n'est pas possible de leur donner plus de longueur, ou, comme les wagons suisses, de les monter sur deux wagonnets chacun à quatre roues. Nous ne pouvons évidemment répondre à ces objections ; et si elles semblent insurmontables, l'on sera bien réduit à se servir des types existants.



Nos wagons à voyageurs sont tous disposés en compartiments; il y aurait peut-être de grandes difficultés à enlever les cloisons, la solidité de la voiture en serait vraisemblablement compromise; du reste, une fois que l'on transforme, il est plus simple de prendre les wagons à marchandises; leur prix de revient est beaucoup moins élevé, et la somme à payer aux compagnies pour dégradations de leur matériel serait naturellement bien moins considérable que si l'on voulait transformer des wagons à voyageurs.

Chaque compagnie possède un certain nombre de modèles en service, parmi lesquels on peut faire un choix pour ne transformer que les plus grands. Voici le tableau des dimensions des principaux modèles actuellement existants :

| COMPAGNIES.                                   | LONGUEUR<br>intérieure. | LARGEUR<br>intérieure. | HAUTEUR<br>intérieure. | LONGUEUR<br>des<br>tampons. |
|---|-------------------------|------------------------|------------------------|-----------------------------|
| C <sup>ie</sup> de Lyon, modèle J. . . . .    | 5 <sup>m</sup> ,50      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,20     | 0 <sup>m</sup> ,50          |
| C <sup>ie</sup> du Nord . . . . .             | 5 <sup>m</sup> ,45      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,40     | 0 <sup>m</sup> ,45          |
| C <sup>ie</sup> du Midi, modèle K. . . . .    | 6 <sup>m</sup> ,45      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,20     | 0 <sup>m</sup> ,50          |
| C <sup>ie</sup> de l'Est, { modèle N. . . . . | 4 <sup>m</sup> ,70      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,45     | 0 <sup>m</sup> ,45          |
| { modèle V. . . . .                           | 5 <sup>m</sup> ,45      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,45     | 0 <sup>m</sup> ,45          |
| C <sup>ie</sup> de l'Ouest, modèle K. . . . . | 6 <sup>m</sup> ,00      | 2 <sup>m</sup> ,55     | 2 <sup>m</sup> ,20     | 0 <sup>m</sup> ,50          |
| C <sup>ie</sup> d'Orléans, modèle K. . . . .  | 5 <sup>m</sup> ,90      | 2 <sup>m</sup> ,50     | 2 <sup>m</sup> ,45     | 0 <sup>m</sup> ,45          |

Les trois types les plus grands sont le type K de la compagnie du Midi, le type K de la compagnie de l'Ouest, le type J de la compagnie de Lyon. Nos recherches, dans lesquelles nous avons reçu les conseils d'un des principaux fonctionnaires de la compagnie de Lyon, ont porté sur le modèle J de cette compagnie; mais la transformation que nous proposons peut *à fortiori* servir pour les deux autres modèles supérieurs à celui que nous avons pris pour ainsi dire comme unité. Si nous eussions adopté un autre type, les résultats eussent été inverses, et nous avons voulu nous maintenir dans les conditions actuelles, n'utiliser que le matériel déjà existant; si l'on obtient que les compagnies en créent un nouveau, les mêmes données pourront s'appliquer avec plus de facilité encore.

Comme but à atteindre, nous avons cherché à créer un wagon pouvant contenir dix lits, tout en réservant assez de place pour loger un poêle, une table, une chaise, une étagère et quelques ustensiles.

La longueur du wagon J de la compagnie Paris-Lyon-Méditerranée est de 5<sup>m</sup>,50; étant donné que trois brancards doivent trouver place dans la longueur, chaque brancard ne peut mesurer plus de



1<sup>m</sup>,75, il restera 25 centimètres disponibles, bien nécessaires pour avoir entre chaque brancard et entre les cloisons un intervalle minimum de 5 centimètres. D'un autre côté le wagon mesure 2<sup>m</sup>,50 de large; si nous donnons 0<sup>m</sup>,75 à chaque brancard, il restera un espace de 1 mètre disponible; on pourra donc réserver un passage de 0<sup>m</sup>,95 entre les brancards, tout en les maintenant à quelque distance de la paroi du wagon, ce qui est nécessaire pour éviter les chocs. Sur ces dimensions 1<sup>m</sup>,75 et 0<sup>m</sup>,75, nous avons construit le brancard suivant. (Voy. *fig. 3.*)

Il se compose de deux parties : l'une B, fixée au plancher du wagon; l'autre B', mobile et fixée sur la première au moyen d'une clavette C, qui existe de chaque côté. — La partie fixe B est en tôle; elle forme une sorte de cadre léger, destiné à relier les quatre ressorts dont nous allons parler et à recevoir la partie supérieure B' qui constitue le brancard proprement dit. Celle-ci est formée par un cadre de bois, sur lequel est tendue une toile et repose un matelas M qui, pour ne pas vaciller, est fixé sur les côtés du brancard par une rangée de clous de tapissier, mais assez lâchement, toutefois, pour que le matelas puisse légèrement s'enfoncer en déprimant la toile; un appui-tête A, mobile, est fixé dans le corps du brancard par deux petites tiges métalliques intérieures; il sert de point d'appui au matelas et à un oreiller triangulaire O. — La hauteur du brancard mobile, y compris le matelas, n'atteint pas 25 centimètres; celle de l'appui est de 33, ou avec le brancard lui-même de 40. — Le brancard peut s'enlever facilement au moyen de quatre poignées P disposées par paires sur les côtés et de quatre autres semblables placées aux extrémités. Ce nombre de huit poignées permet de saisir facilement le brancard dans toutes les positions, ce qui est indispensable pour le manier dans un espace aussi restreint que l'intérieur d'un wagon.

Dans les voitures américaines ou allemandes, on pouvait suspendre les brancards en prenant un point d'appui sur les colonnes en bois qu'ils possèdent; dans nos wagons l'on ne pouvait en faire ajouter, car l'espace est déjà trop restreint; d'un autre côté, on ne peut placer un brancard directement sur le plancher du wagon, le malade serait soumis à tous les chocs, à une trépidation continue; on est donc conduit à adopter un système mixte, à monter les wagons-lits inférieurs sur des ressorts dans le genre des lits des trains bavarois, et à suspendre les lits supérieurs pour lesquels il n'est pas d'autre moyen possible de les soustraire aux mouvements communiqués par le wagon.

Les ressorts dont nous faisons usage (Voy. *fig. 3*) sont composés d'une première bande d'acier de 5 centimètres de large et dont la corde mesure 40 centimètres; une seconde bande d'acier de moindre



longueur vient se surajouter à cette première et se trouve fixée par quatre boulons de chaque côté, de manière à faire corps avec elle. L'épaisseur de ces bandes ne peut être déterminée que par l'expérience; elles doivent être assez élastiques pour amortir les chocs et la trépidation, mais ne doivent pas, sous la charge du lit-brancard et de l'homme, subir une flexion constante de plus de 2 à 3 centimètres; les ressorts sont fixés au sol par une de leurs extrémités, au moyen d'une articulation métallique; l'autre extrémité est munie d'une petite roulette évidée qui glisse sur une sorte de rail très-court (Voy. *fig. 4 et 5*). Cette disposition était nécessaire, car si les ressorts avaient été fixés par leurs deux extrémités, ils n'auraient naturellement pas pu fléchir sous le poids.

Le brancard lui-même, ou plutôt le cadre en tôle B, garni de quatre pieds, entre dans une mortaise métallique surajoutée au ressort, et se trouve fixée par un écrou qui en temps ordinaire n'est pas démonté. (Voy. *fig. 6*).

Pour les brancards-lits supérieurs, l'on ne pouvait espérer prendre un point d'appui bien solide sur les plafonds du wagon; on a vu que dans les premières expériences faites en Allemagne, lorsque l'on cherchait à y suspendre des hamacs, les crochets ne tardaient point à s'arracher sous le poids; mais si l'on fait passer transversalement au-dessous du plafond une tige tubulaire métallique qui vient prendre un point d'appui sur les parois du wagon, on peut espérer rencontrer sur cette tige métallique une résistance suffisante, car l'effort portera uniquement sur les parois et suivant la verticale; nous désirons la tige *tubulaire*, afin de lui donner un peu plus de volume en diminuant son poids.

Le lit-brancard est suspendu au moyen de deux cadres métalliques en fer forgé qui peuvent avoir un moindre diamètre que les tiges transversales, et dont les tringles verticales viennent s'accrocher au cadre au moyen d'un petit anneau, disposition que montre la figure 8.

Il était nécessaire de fixer le cadre soutenant le brancard à la tige tubulaire transversale par un système à la fois solide et élastique. En se bornant à leur interposer des anneaux de gutta-percha, l'on se fût certainement exposé à voir ces anneaux se couper à chaque instant. Pour parer à cet accident, les deux tiges métalliques horizontales présentent chacune trois bobines en bois très-dur de 10 centimètres de longueur sur 5 de diamètre (Voy. *fig. 7*); entre ces bobines sont alors enroulés de forts anneaux de gutta-percha de 10 centimètres chacun de largeur; la résistance se fait ainsi sur une ligne de 30 centimètres, et, en supposant même que l'un des anneaux vint à se rompre, les deux autres suffiraient et au delà pour soutenir le lit-brancard. Lorsque l'on veut changer les bobines, il suffit de décrocher la tige tubulaire transversale; mais, à vrai dire,



c'est une manœuvre qu'il ne serait pas toujours facile de faire, le train étant en marche et le wagon rempli de malades : aussi a-t-on donné aux anneaux de gutta-percha et aux bobines une résistance suffisante pour que la rupture ne puisse jamais se produire. Pour un simple changement d'anneaux, il y aura beaucoup moins de difficulté : il suffira d'avoir eu la précaution de placer entre les tiges métalliques horizontales un ou deux anneaux flottants, qui en temps ordinaire ne supporteront aucun effort; s'il s'agit alors de remplacer un des anneaux, on n'aura qu'à soulever un peu le brancard-lit et à faire glisser l'anneau de rechange sur la bobine. C'est une manœuvre que l'on pourra exécuter sans déplacer le malade.

Avec le double système de suspension pour les brancards supérieurs, de ressorts pour les brancards inférieurs, on pourra introduire, dans le wagon, le malade couché sur son lit; suivant le cas, on placera le brancard sur un des cadres de tôle et on l'y assujettira au moyen des deux clavettes, ou bien deux hommes le soulevant avec les poignées placées aux deux extrémités, un troisième introduira les crochets terminant les tiges verticales dans les anneaux fixés sur les côtés du brancard. La manœuvre est des plus simples : trois hommes suffisent pour l'exécuter même pour les lits qui, par une de leurs extrémités, touchent aux parois du wagon.

Il serait très-important, en construisant de nouvelles voitures d'ambulance, type Masson ou autres, de donner aux brancards les mêmes dimensions que pour ceux des wagons, de les garnir de poignées et d'anneaux, en un mot d'avoir un brancard unique qui s'adaptât aussi bien aux voitures qu'aux wagons-ambulances. Les dimensions que nous proposons nous semblent convenir à ce double usage; dans tous les cas, le matelas et l'oreiller doivent être recouverts d'un tissu à peu près imperméable, plutôt de cuir que de toute autre substance, car si le cuir est plus cher, il dure infiniment plus longtemps, ce qui constitue une économie réelle. On pourra toujours, dans les wagons-ambulances, interposer entre l'homme et le matelas quelque tissu de caoutchouc, afin d'empêcher ce dernier de se souiller trop rapidement.

On pourrait craindre, en raison de la suspension du brancard-lit supérieur, de lui voir subir des secousses ou des balancements, des chocs même pénibles pour le malade; il suffira, pour les prévenir, de faire passer les tiges verticales, correspondant à la paroi du wagon, dans un petit anneau fixé dans cette paroi (Voyez *fig. 11*) et qui, pour plus de commodité, sera fait à articulation, de sorte que l'on n'aura qu'à l'ouvrir lorsqu'on voudra démonter le brancard-lit supérieur. Il restera entre les deux brancards superposés un espace de 0<sup>m</sup>,78, et entre le plus élevé et le plafond de 0<sup>m</sup>,75, ce qui est très-suffisant pour un homme assis, car il faut bien compter que les ma-



telas seront fortement déprimés par le poids de l'homme, ce qui tendra naturellement à augmenter l'espace disponible.

Le wagon modèle J de la compagnie Paris-Lyon-Méditerranée peut recevoir dix lits ainsi disposés, six d'un côté, quatre de l'autre; il restera à côté des quatre lits assez de place pour y loger une table de 0<sup>m</sup>,75 sur 0<sup>m</sup>,55, pourvue d'un tiroir, un fauteuil pour l'infirmier de garde, une armoire à compartiments et tiroirs de 0<sup>m</sup>,90 sur 0<sup>m</sup>,70, et une planche-étagère de 1<sup>m</sup>,80 de long sur 0<sup>m</sup>,60 de large; elle devra seulement être un peu échancrée au niveau du poêle. (Voyez *fig. 9 et 10.*)

Dans l'armoire, on pourra loger ce qu'en terme de chirurgie l'on appelle *un appareil*, c'est-à-dire les objets nécessaires pour un assez grand nombre de pansements, quelques médicaments qu'il faut toujours avoir sous la main, les assiettes, les gobelets et autres ustensiles pour les repas de dix hommes. Sur l'étagère, on logera les sacs des malades, leurs petits bagages, et si tous les sacs ne peuvent y tenir, on les accrochera facilement, au moyen de courroies de cuir, aux tiges métalliques horizontales dans l'espace qui correspond au passage central. En les suspendant à plat, il restera assez de hauteur pour que la circulation ne soit pas interrompue.

En hiver, il faut de toute nécessité avoir un poêle; le chauffage par les courants de vapeur ou d'eau chaude offre des difficultés pratiques considérables devant lesquelles reculent les compagnies, même pour leurs trains de voyageurs, tandis que rien n'est plus facile que d'avoir un bon poêle, à peu près semblable à celui que renferment les bureaux de poste ambulants. La partie supérieure serait terminée par un manchon métallique de 0<sup>m</sup>,40 de diamètre, traversé par le tuyau, et qui renfermerait de l'eau, bientôt échauffée, que l'on aurait ainsi toujours à sa disposition, au moyen d'un robinet. Le charbon nécessaire à l'alimentation du foyer se trouverait placé sur un wagon-plate-forme, et il en serait fait une distribution régulière lors des arrêts du train.

Un certain nombre d'autres ustensiles sont encore nécessaires pour l'usage des dix malades du wagon: des crachoirs, des urinoirs, etc.; enfin, un bassin à double fond et à cuvette qui, en temps ordinaire, aurait sa place naturelle sur la plate-forme, en dehors de la porte du wagon, et ne serait apporté à l'intérieur que pour les malades gravement atteints; du reste, ceux qui ne peuvent se lever font usage de bassins que l'on vide instantanément. L'eau froide nécessaire au service de chaque wagon, peut être logée dans une petite caisse métallique triangulaire qui trouve sa place naturelle dans l'angle correspondant au poêle.

Pour s'adapter complètement à sa nouvelle destination, le wagon J de la compagnie Paris-Lyon-Méditerranée a besoin de quel-



ques grandes modifications, que l'on peut prévoir d'avance. La grande porte roulante qui se ferme sur les faces latérales doit être immobilisée et fermée hermétiquement, au moyen d'un calfatage avec toile imperméable, et ces mêmes faces seront percées de trois fenêtres du côté correspondant aux six lits, de quatre seulement du côté des quatre lits; elles mesurent 0<sup>m</sup>,75 sur 0<sup>m</sup>,50 (*fig. 9*), se ferment au moyen de vitres descendantes; des rideaux de toile bleue mettent à l'abri des rayons du soleil.

La plus grande modification consiste dans le percement de portes à deux battants aux extrémités du wagon, larges de 1 mètre, hautes de 1<sup>m</sup>,80, et pourvues de larges vitrages que l'on peut ouvrir à l'intérieur pour ventiler le wagon (*Voyez fig. 12*). Elles viennent donner sur une sorte de plate-forme jetée au-dessus de la tige fixe des tampons (*Voyez fig. 10*) et qui mesure 0<sup>m</sup>,50 à 0<sup>m</sup>,60; entre deux wagons placés à la file, il restera toujours un espace vide que l'on pourra combler au moyen d'un pont métallique qui se repliera accidentellement sur la plate-forme du wagon; lorsqu'il sera jeté entre les deux voitures, il ne fera que glisser sur l'autre plate-forme sans pouvoir, par conséquent, être brisé par les va-et-vient des deux wagons correspondants. Il existera, du reste, un marchepied à chaque extrémité (*fig. 12*), afin que l'on puisse facilement descendre du train.

Tel est à peu près l'aménagement du wagon-ambulance qu'il est possible de construire avec le wagon J de la compagnie Paris-Lyon-Méditerranée; il est évident que les wagons plus grands, le modèle K de la ligne du Midi, le modèle K de la compagnie d'Orléans, s'y prêtent également bien, et que l'on pourra y adapter le matériel de transformation que nous proposons.

En étudiant les trains sanitaires allemands, nous avons pu voir qu'il faut encore un certain nombre de voitures-annexes pour le service, la cuisine, le logement du personnel, etc.; ces wagons devront tous appartenir au même type, être percés de portes aux deux extrémités, afin que la circulation soit facile d'une extrémité à l'autre du train, que l'on pourra constituer de la façon et dans l'ordre suivants :

Immédiatement après le tender :

1° Un fourgon à bagages pour le personnel dépendant de la compagnie du chemin de fer; il pourrait aussi recevoir une partie du matériel du train;

2° Un wagon-salon ou autre approprié pour le logement du personnel médical;

3° Un wagon à malades, mais de douze lits, c'est-à-dire sans poêle, pour les infirmiers et gens de service;

4° Neuf wagons à malades à dix lits chacun;

5° Le wagon-cuisine;



6° Un wagon pour le charbon, partagé dans la longueur en trois parties, celle du milieu servant de couloir pour passer d'un wagon à l'autre, et celle de chaque côté servant de magasin à charbon, à claire-voie et à ciel ouvert;

7° Neuf wagons à malades de dix lits chacun;

8° Un fourgon à bagages pour le matériel et pourvu d'une vigie pour le serre-frein.

En totalité, le train renfermerait, par conséquent, 24 voitures, ce qui, d'après les gens du métier, est la bonne composition d'un train devant marcher avec une vitesse de 45 à 50 kilomètres à l'heure, sans compter les arrêts.—Si l'on voulait, mais ce serait un tort à nos yeux, diminuer un peu la vitesse, on pourrait ajouter deux wagons à malades; le train renfermerait alors 200 places, tandis qu'avec les 24 voitures, il ne peut en disposer que de 180 (dix par wagon à malades).

On trouvera peut-être que six wagons-annexes sur vingt-quatre sont en nombre excessif, et cependant il n'y a guère moyen d'en supprimer un seul, si l'on veut assurer l'alimentation régulière des malades pendant le voyage, ce qui est indispensable. On pourrait objecter qu'il serait facile d'avoir dans les principales gares des magasins à provisions, auxquels l'on télégraphierait à l'avance l'arrivée du train, et qui prépareraient un repas pour 200 malades et le personnel; mais ce serait bien peu connaître les difficultés des temps de guerre que de croire une pareille mesure toujours applicable; le plus souvent, on ne trouverait rien de prêt dans les buffets militaires, et l'on perdrait trois et quatre heures pour arriver à donner aux malades un potage et un morceau de pain; puis, est-il possible de toujours prévoir les lignes que suivront les trains sanitaires, les embranchements qu'ils seront forcés de prendre? Un train expédié, par exemple, de la frontière de Belgique vers le Midi, vers Bordeaux, peut y arriver par cinq ou six routes différentes, s'il a dû déposer ou prendre des malades en certains points déterminés.

Un train sanitaire doit être comme un navire; lorsqu'il se met en route, il renferme tout ce qui est nécessaire à sa subsistance pendant un laps de temps déterminé, et, durant le voyage, il ne doit faire que les provisions facilement et partout renouvelables. Le malade doit se sentir confortablement installé, n'y point connaître cette misère qu'il aura déjà trop éprouvée pendant la campagne et même dans les premières ambulances où il a été recueilli. L'organisation d'un train sanitaire peut devenir quelque chose de très-complet, si l'on veut bien, lors de l'installation, ne pas faire les choses à demi, mais accorder largement tout ce qui est nécessaire.

Pour terminer la question du matériel, il importe de rechercher



actuellement les moyens pratiques de se le procurer. Tout d'abord, combien faudrait-il organiser de trains? Ceci est évidemment difficile à fixer; mais en admettant qu'il en soit créé douze, l'on aurait 2,160 places disponibles, chiffre déjà assez élevé, qui permettrait d'attendre un peu les événements, de suffire aux besoins des premiers combats, et aurait l'avantage de correspondre à peu près au chiffre de nos corps d'armée. La chose importante, c'est que l'on crée le matériel des trains sanitaires pendant la paix, que l'on n'attende pas le moment du besoin pour y songer, car alors il est trop tard, l'on ne fait absolument plus rien de bon, de pratique, et l'on dépense des sommes bien plus considérables pour ne pas obtenir un bon résultat. Prenons ce chiffre de 12 trains pour fixer la discussion; il est évident que le ministère de la guerre ne peut, pendant la paix, posséder 288 wagons pour ces 12 trains sanitaires, et les emmagasiner comme il le fait de ses fourgons; ce serait immobiliser un capital considérable, sans compter que ces 288 wagons devraient être logés dans des remises à portée des voies de chemins de fer, d'où achats ou locations de terrains, de hangars, etc. Mais si les wagons sont difficiles à loger, il n'en est pas de même du matériel nécessaire à la transformation, qui peut être accumulé en quantité considérable dans des espaces relativement restreints.

On pourrait donc commencer par étudier un modèle de wagon-ambulance, celui que nous proposons ou un autre, si *à priori* on regarde ce dernier comme devant être supérieur; on ferait transformer un wagon à marchandises sur ces bases, ainsi qu'un wagon-cuisine et un fourgon à provisions; puis ce matériel d'essai voyagerait pendant plusieurs jours de suite sous la direction d'une commission spéciale, dans laquelle l'élément médical devrait naturellement être très-sérieusement représenté, en transportant un certain nombre de malades convalescents, auxquels ce voyage ne pourrait faire aucun mal, mais que l'on serait néanmoins obligé de soigner en route. C'est là le seul moyen de se placer, autant que possible, dans les conditions où l'on suppose un train sanitaire en temps de guerre. Ces premiers essais amenant évidemment des transformations, au bout d'un certain nombre de tâtonnements, on arriverait à posséder un type qui remplirait toutes les conditions désirables; on n'aurait plus alors qu'à faire construire le matériel de transformation, brancards, lits, ressorts, suspensions, poêles, objets matériels, et tout cela serait emmagasiné soit dans les docks de l'administration, soit, mieux encore, dans les ateliers des différentes compagnies qui, moyennant une assez faible location, se chargeraient volontiers de la garde de ce matériel. Au moment du besoin, on adressera à la compagnie du chemin de fer une réquisition



pour un nombre de wagons-ambulances et de wagons-annexes correspondant au matériel de transformation qu'elle possédera, et, en huit jours au plus, les trains sanitaires pourront être prêts à partir.

Il semble avantageux de confier la transformation aux ateliers spéciaux des chemins de fer, qui ont des ouvriers habiles et expérimentés dans ce genre de travaux; l'opération serait menée plus rapidement, avec plus de précision, et l'on n'aurait pas besoin de demander un travail supplémentaire aux ateliers militaires qui, au moment de la guerre, ont toujours plus de commandes qu'ils ne peuvent en exécuter. C'est aussi dans le but de gagner du temps qu'il convient d'arrêter à l'avance combien chaque compagnie devra livrer de trains et en quels points du territoire, correspondant naturellement aux grands centres militaires du pays.

Un wagon modèle J de la compagnie Paris-Lyon-Méditerranée, revient environ à 2,700 francs; le prix de la transformation est difficile à fixer à l'avance; cependant il est peu probable qu'il dépasserait 1,000 à 1,500 francs; en tous cas, on sera fixé sur la dépense lorsque l'on aura adopté un type défini. Par un traité spécial avec les compagnies, il serait convenu que, après la campagne, le gouvernement aurait à payer la location du wagon pour tout le temps pendant lequel il en sera fait usage, plus les frais de réparation pour remettre le wagon dans son état primitif.

Nous n'avons pas à insister davantage sur cette question, qui rentre naturellement dans le domaine de l'administration, et nous ne nous y sommes arrêté quelques instants que pour montrer la nécessité d'avoir, *en temps de paix*, le matériel des trains sanitaires, afin de le trouver tout prêt *pour le temps de guerre*, et sur la possibilité d'y arriver sans difficultés, pour peu que l'on aborde le problème avec la ferme intention de le résoudre.

La question du personnel des trains sanitaires est d'une haute importance; elle doit être également tranchée pendant la paix, afin qu'il n'y ait point d'hésitation au moment de la mobilisation. Un train composé, ainsi qu'il a été dit plus haut, nécessite le personnel suivant :

1<sup>o</sup> *Personnel de secours*. — 1 médecin-directeur du train, 3 médecins assistants, 6 infirmiers de visite (2 sergents, 2 caporaux et 2 hommes), 12 infirmiers ordinaires (2 sergents, 2 caporaux et 8 hommes), 2 cuisiniers et 1 aide; enfin, un officier d'administration chargé de la garde du matériel.

2<sup>o</sup> *Personnel technique du train*. — 1 conducteur-chef, 2 serre-freins, 1 ouvrier mécanicien pour les petites réparations à faire en route au matériel spécial.

Le personnel de secours devrait être entièrement placé sous la



direction et le commandement du médecin en chef; nous avons développé plus haut, avec des arguments fournis par les documents étrangers, la nécessité de confier le commandement à l'élément le plus important du train sanitaire, qui est évidemment le médecin. Plus encore que dans une ambulance, il importe qu'il ne se produise pas de conflits; l'expérience de la guerre 1870-1871 a montré une fois de plus les dangers de l'irresponsabilité du corps médical, et nous devons espérer que l'avenir ne nous réservera pas les mêmes douleurs, les mêmes cruelles expériences.

Le médecin en chef du train doit appartenir au corps médical militaire régulier, et avoir au moins le grade de médecin-major; le service médical qui lui est confié est assez important pour exiger un réel degré de maturité et d'expérience. Le premier aide, destiné à remplacer le médecin en chef, doit, comme lui, appartenir à l'armée permanente; les deux autres peuvent être choisis dans les médecins de la réserve que la nouvelle loi va mettre, pour la durée de la guerre, à la disposition de l'armée.

Le rôle de l'officier d'administration se trouve naturellement tracé; après avoir pris en charge le matériel du train, il veille à son bon entretien, est comptable des deniers, procède aux achats qu'il est indispensable de faire pendant la route, remplit, en un mot, les fonctions d'un commissaire à bord d'un navire, mais demeure subordonné au médecin en chef et obéit à ses réquisitions, sauf recours à l'autorité supérieure, s'il y a abus.

Six infirmiers de visite ne sont pas de trop pour 180 malades; ils partagent, d'ailleurs, le service de garde avec les 12 infirmiers ordinaires, en sorte que la moitié du personnel est toujours sur pied pendant que l'autre se repose; ce service est, du reste, organisé de la façon suivante : après les pansements, la visite, le nettoyage général le matin, où tout le monde fonctionne, la garde se prend à midi et dure jusqu'à neuf heures du soir; pendant cet espace de temps, 4 médecin, 3 infirmiers de visite, 6 infirmiers ordinaires, c'est-à-dire un pour deux wagons, restent continuellement à la disposition des malades; puis, à neuf heures, ils vont se coucher et sont remplacés par l'autre bordée de même force, qui garde le service jusqu'à six heures du matin.

On dira peut-être que cela n'est pas bien pénible; mais lorsqu'on veut exiger des hommes un travail permanent, il faut ne les point écraser et leur laisser le temps de se reposer, sans quoi ils ne font plus rien avec entrain. Il y aura, du reste, nombre de circonstances où, pour nous servir de l'expression maritime, il faudra appeler tout le monde sur le pont : tels sont, par exemple, l'arrivée dans de grandes gares, les chargements ou déchargements de malades, etc.

C'est à dessein que nous ne comprenons point de pharmacien



dans les trains sanitaires ; le petit nombre de médicaments qui sont indispensables peuvent être renfermés dans un coffre placé dans un des wagons d'approvisionnements ; le premier aide en fera la distribution aux infirmiers de visite et s'assurera qu'ils sont réellement donnés aux malades. Un train sanitaire est une ambulance roulante ; or, nous savons tous combien les pharmaciens y sont peu utiles, tandis qu'ils peuvent rendre de véritables services dans quelques grands établissements.

Les vivres, les approvisionnements divers, conserves, etc., devront être remis au comptable par les magasins militaires territoriaux, et suffisants pour le voyage d'aller vers l'armée et celui de retour ; il ne faut point compter s'approvisionner au voisinage du corps d'armée actif ; que l'on soit en pays ami ou en pays ennemi, toutes les provisions sont rares, tout au plus pourra-t-on prendre du pain et de la viande fraîche. En se rendant à vide vers l'armée, les trains sanitaires seront avantageusement utilisés pour transporter du matériel soit pour le service des ambulances, soit pour celui de l'armée en général ; il suffira de démonter les brancards-lits, de les placer tous dans deux ou trois wagons ; en quelques heures, on pourra mettre de nouveau le train en état de recevoir les malades.

Il est fort important que, dans ce nouveau service, il ne puisse exister aucune incertitude, que les moindres détails soient prévus par un règlement très-précis et que le personnel destiné à le diriger ait, pendant la paix, été mis au courant de ses fonctions : aussi pourrait-on profiter des grandes manœuvres qu'opéreront les corps d'armée pour organiser un train sanitaire à titre d'exercice ; il servirait à transporter aux hôpitaux du voisinage les malades des camps que le Gouvernement a l'intention de multiplier. Il y aurait aussi tout avantage à ce que, pour les trains sanitaires comme pour les ambulances, ce personnel fût désigné à l'avance ; que, par exemple, le train n° 10 devant être équipé à Lyon, le personnel médical et les infirmiers nécessaires fussent désignés pour l'accompagner, en cas de mobilisation.

C'est en prenant ces précautions, traitées trop souvent de méticuleuses et d'inutiles, que l'on peut arriver à mobiliser les nombreux services d'une armée en campagne et à se présenter devant l'ennemi avec la plénitude de ses moyens d'action.

Le service des trains sanitaires se relie de près à celui des évacuations, qui doit être également prévu et organisé théoriquement en temps de paix. Les créations de lignes particulières d'évacuation qui résultèrent des décisions ministérielles des 25 décembre 1870, 10 et 12 janvier 1871, peuvent servir de guide pour l'avenir ; il paraît cependant plus logique d'en venir à une organisation, sinon tout à fait semblable, au moins très-voisine de celle des



étapes dans l'armée allemande. Le service des évacuations rentre-rait dans les attributions du médecin en chef des étapes, qui toujours en relation télégraphique d'une part avec les médecins en chef des corps d'armée, de l'autre avec les hôpitaux de l'intérieur, pourrait signaler aux trains sanitaires sur quels points ils doivent aller chercher des malades et sur quels autres ils doivent les transporter. Une fois l'ordre de route remis au médecin-directeur du train, il ne doit pouvoir être arrêté ni détourné de sa route par personne ; si chaque autorité locale a le droit de le requérir de se déranger de sa route, ou de stationner, il n'arrivera jamais à sa destination. Suivant les besoins du service et la nature de la campagne, le médecin en chef des évacuations se tiendra au centre du parcours entre le territoire et l'armée ou à proximité de celle-ci ; il pourra, du reste, dans l'une ou l'autre de ces positions, être remplacé par un subordonné direct, muni des pouvoirs nécessaires pour diriger les trains et régler le service de marche.

Il nous reste à envisager les relations qui doivent exister entre les trains sanitaires et les compagnies de chemins de fer. Dans l'organisation d'un train sanitaire, nous avons compris un chef de train, deux serre-freins et un ouvrier ; ce dernier doit être détaché d'une façon permanente par l'atelier qui a construit le train ; il recevra une indemnité spéciale et les vivres. Les trois autres employés seront essentiellement mobiles et prendront le train à son entrée dans le réseau de leur propre compagnie pour le conduire jusqu'à destination ou jusqu'à un nouveau réseau. Un exemple fera mieux comprendre ce service : un train sanitaire part de la frontière de Belgique, par exemple, à destination de Bayonne ; la gare d'expédition a signalé son départ, la feuille de route est prête, il part accompagné de son chef de train et des deux serre-freins qui le conduisent jusqu'à Paris, et, au chemin de fer de ceinture, le remettent entre les mains des employés de la compagnie d'Orléans ; un nouveau chef de train l'accompagne jusqu'à Bordeaux ; un dernier, enfin, de la compagnie du Midi, le prend en gare de Bordeaux pour le mener à Bayonne. Pendant tout le voyage, le médecin directeur du train n'a pas eu à s'occuper de la route ni des arrêts ; il a pu seulement constater si l'on s'est écarté, et pour quelles raisons, de la feuille de route qui lui a été remise par la gare expéditrice.

La marche des trains sanitaires doit être soumise aux mêmes règles que celle des trains spéciaux sur les lignes ferrées, c'est-à-dire que chaque train, commandé à l'avance, est annoncé sur toute la ligne et que sa marche est tracée par une feuille spéciale. Le médecin directeur pourrait, s'il voit nécessité absolue de stationner dans une gare, faire supprimer son train en cours de route, mais



une fois supprimé, ce train ne pourrait reprendre sa marche qu'après que les mesures prescrites, pour le nouvel itinéraire à donner, auraient été prises par qui de droit, et tous les ordres utiles donnés.

Ces conditions sont essentielles, même sur une ligne à double voie, afin d'arriver à une marche régulière et d'éviter les accidents. Elles seraient bien plus compliquées encore si le train spécial devait passer sur une ligne à voie unique, où la marche des trains est soumise à des règles plus strictes que sur les lignes à double voie. Sur les premières, en effet, il faut commander les garages et les croisements, donner les ordres assez à l'avance pour que les gares intéressées en accusent réception à l'agent spécial, qui ne peut faire partir le train que quand toutes ces formalités ont été rigoureusement remplies.

Le médecin-directeur du train ne doit, en aucune façon, intervenir dans la marche du train; son rôle se borne à s'entendre avec les chefs de service spéciaux de la voie sur l'heure du départ, à indiquer sa destination, ainsi que les points où il croit utile de faire donner des arrêts prolongés. Si, pendant la route, un événement fortuit l'obligeait à changer de direction, il attendrait en gare que les ordres nécessaires aient pu être donnés pour régler la nouvelle marche du train.

En un mot, dans un train sanitaire, il y a deux services : celui des malades, qui regarde le médecin seul; celui de la marche, qui regarde les compagnies de chemins de fer, sauf observations ou réclamations adressées par le médecin à qui de droit, si on lui paraît avoir négligé certaines précautions ou modifié la feuille de route.

En terminant cet aperçu sur l'organisation des trains sanitaires, sur leur mode de fonctionnement tant en France qu'à l'étranger, nous désirons vivement que l'exemple des remarquables résultats obtenus par les Américains et les Allemands ne soit pas absolument perdu pour nous. Si l'avenir nous réserve de nouvelles campagnes, puissent nos soldats blessés et malades profiter des avantages de la dissémination et du rapatriement, que, seuls, des trains sanitaires, bien organisés et préparés en temps de paix, pourront permettre d'obtenir pendant la période de guerre.

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Professeur-agrégé à l'École d'application de médecine militaire.

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LES TRAINS SANITAIRES. — TRANSFORMATION DES WAGONS A MARCHANDISES FRANCAIS EN WAGONS-AMBULANCES.

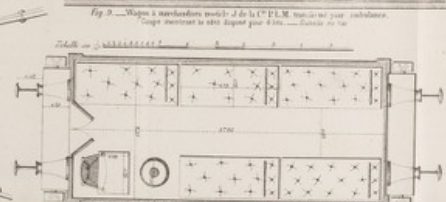
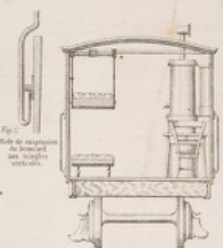
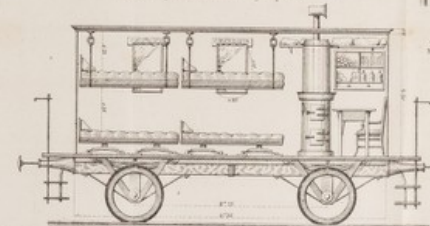
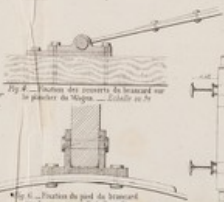
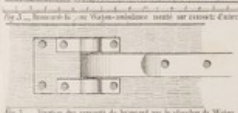
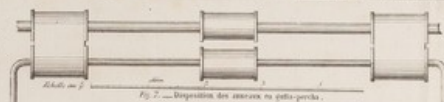
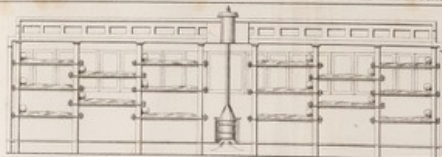


Fig. 3. — Section des ressorts du brancard sur la planche du wagon.

Fig. 6. — Section du pied de brancard sur le wagon.

Fig. 10. — Wagon à marchandises modèle J de la C<sup>ie</sup> P. L. M. transformé pour ambulance.



