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"Tents," from their Earliest Period to the Present Time; showing the Necessity for providing Waterproof and Well-Ventilated Tents for the covering of Troops in the Field; and the evil results when inefficient shelter is provided: Considered in a sanitary and pecuniary point of view

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Maps—Plans.

Map of the Gwalior District, in 4 sheets. *Presented by Secretary of State for War.*

MUSEUM.

Military.

Two Liquid fire Rifle-shells, adapted to a deep-grooved Enfield Rifle.

Presented by Capt. J. Norton.

“TENTS,” from their EARLIEST PERIOD to the PRESENT TIME; showing the NECESSITY for providing WATERPROOF and WELL-VENTILATED TENTS for the covering of Troops in the Field; and the evil results when inefficient shelter is provided: considered in a sanitary and pecuniary point of view.

By GODFREY RHODES (MAJOR UNATTACHED).

THE subject of “tent-architecture” is one of very early origin; and, although the necessity of supplying efficient shelter for troops in the field is at the present time fully acknowledged, yet little or nothing has been done towards accomplishing that requirement.

It is a fact that enormous sums of money and great encouragement are awarded for the perfection of destructive missiles; yet little or no support, and but scanty supplies are granted, towards (what ought to be the first step) supplying efficient shelter for the preservation of the health of our own troops when encamped in the field.

The earliest mention we have of tents is in the 4th chapter of Genesis and the 20th verse, where we are told that “Jabal was the father of such as dwell in tents and of such as have cattle;”* evidently meaning that he was the inventor of tents, and of pitching those moveable habitations required for a nomadic life.

We find after the Flood, that Noah,† Lot,‡ Abraham, and the two sons of Isaac (Esau and Jacob§), lived in tents; and, although it is natural to suppose that, as “Esau was a cunning hunter and a man of the field,” he required those portable dwellings, yet we find (Genesis, chap. 25) that “Jacob was a plain man dwelling in tents,” giving us sufficient evidence that tents were the earliest constructed habitations of man.

It is impossible to ascertain with precision what was the peculiar form and construction of the Patriarchal tents; but, as the Arabs deviate so little from the customs of their forefathers, we shall not be far from the truth if we consider the present Arab tent the nearest existing approximation to the ancient model.

To illustrate the subject I will briefly describe the present Arab family tent.

Their most usual sized tent is from 25 to 30 feet long, by about 10 to 12 feet in breadth; it has nine poles. To pitch the tent, the three

* About 4000 years B.C.

† B.C. 2080.

‡ About 3156 years B.C.

§ B.C. 1915 years.

longest poles (viz., from 7 to 10 feet in length) are placed in the middle, at equal distances apart, and three of the others (about 5 or 6 feet long) are placed in like manner on each side; to the top of these, the black goat's-hair cloth (with which the Arabs cover their tents,) is secured; and owing to the skill of the women, who manufacture all the tent coverings, even the heaviest rains do not penetrate this closely woven fabric. The side coverings, or walls, are often of a coarse woollen cloth. The tent-coverings are kept stretched out in the usual manner, viz., by cords, which latter are fastened at one end to the top of the poles, and at the other, to pegs driven into the ground, at the distance of three or four paces from the tent.

The front of the tent is usually kept open, except during the winter, and the back and side hangings are so managed, that the air can be admitted in any direction, or excluded at pleasure.

The weight of a tent of the above dimensions is about 1500 lbs., or the load of two strong camels.* I may mention that tents of much larger, and even smaller, dimensions are used, according to the rank and wealth of the owner.

It is not my intention to enter here into the minute details of the tents and coverings as used by the Israelites during their wanderings in the Wilderness, as such would take up too much time, and perhaps afford but little interest to many of my hearers; but, as there is a diversity of opinion with reference to the various translations of the Hebrew words "Or thakhash," which have been generally rendered badger-skin, (such being supposed to have been used as the outer covering of "The Tabernacle,") I may mention that there is no certainty that the outer covering of "the Tabernacle" must necessarily have been made of badger-skins: on the contrary, the commentators, as Jarchi, &c., raise the question, whether any part of an unclean beast (and such is a badger) should or could have been used for the outer covering of that Sacred building.

The celebrated and generally correct historian Josephus, in his description of the offerings made by the Israelites when encamped at the foot of Mount Sinai, only states "that the upper curtain was of a stuff that was proof against rain;" again, "that the outer covering was of skins, for a shelter against heats and rains, and for a fence against the injuries of the seasons." Niebuhr says, that there is a fish in the Red Sea which the English call porpoise or sea-hog, and which is called by the Arabian merchants "dāhash:" the skin is used for bucklers, and is said to be musket-proof. Other authors say the skins are used for covering huts, &c. It is well known that badgers do not now inhabit (if they ever did) the neighbourhood of Mount Sinai; and, as the porpoise is still to be found in the Red Sea under the name of dāhash, it may fairly be assumed that the "thakhash" of the Hebrew is the "dāhash" or porpoise of the present day. The circumstance of the want of water in the wilderness, and the close approximation of the Red Sea to the Sacred Mount, may be of sufficient circumstantial evidence, that the Holy Tabernacle was covered on the outside with the skin of the porpoise, and not with that of the badger. There is nothing very remarkable in the employment of fish-skins as an

* Camels can carry from about 400 to 700 lbs., and elephants, from 1000 to 1500 lbs. each.

outer covering for tents, for at the present day the "Fishing or Alien Tuski" (a nomadic people who inhabit the extreme northern and eastern point of Asia, bordering on Behring's Straits,) cover their tents with the prepared skin of the walrus, which is so beautifully cured as to retain its elasticity, and, owing to its semi-lucent properties, sufficient light is admitted by the roof to render windows quite unnecessary. Lieutenant Hooper, of the Royal Navy, who, when belonging to H.M. ship "The Plover," wintered amongst that tribe in 1848, states that he saw a walrus-skin of the enormous size of 70 to 80 square feet, and that the whole was as transparent as parchment. I may here mention, that the Alien Tuski can raise the temperature of their tent to 90 and 100 degrees of Fahrenheit: they obtain this great heat by burning lamps filled with train-oil, using the fibres of "weet-weet" or moss as a wick. Lieutenant Hooper says that "there is neither smoke nor smell when these lamps are well trimmed." There is another tribe called the Tungoozes, who cover their tents with fish-skins; these Fishing-Tungoozes inhabit the south-eastern Siberian coasts, from the banks of the river Aldan (63° N. latitude, and 130° E. longitude), and a large river called by the Tungoozes, Okat, signifying, in a somewhat exclusive sense, "The River," which, flowing in a S.S.E. direction from the town of Yudomsk, and passing by Arki, emerges into the Okhotsk Sea, at the seaport town of Okhotsk (55° N. latitude, and 143° E. longitude).

With respect to the general form and mode of constructing the tents of the numerous nomadic tribes which inhabit the earth, it is sufficient to say, that their form is generally conical, sometimes with a centre-pole, but more often formed of straight poles having their upper extremities converging to one centre, and so arranged, that a fire can be lighted within the tent, permitting the smoke to escape through an aperture at the top. The various coverings, or textures, which are used for tents, consist in camel's-hair cloths, rude felt, and goat-skin tissues; reindeer and buffalo skins; the birch-bark, chuco-leaf thatch, palm-mats, reeds, and sword-grass, and the membranous and silky leaves of the vijao-plant; also a species of cloth made from the fibres of a root called lift-adum; the sail-cloth of the modern Laplanders; and the sheltering ice-blocks of the Esquimaux; to say nothing of the brilliantly-coloured cloths, embroidered velvets, and gold-starred satins which have decked the tents of kings, chiefs, and conquerors in Europe and Asia, from the period of the middle ages down to the insignificant and shelterless canvas tents of the present day.

I will not enter into the details of the Tentology of the ancient Jews and Scythians, the Babylonians and the Egyptians, the Greeks and the Romans, neither the Kurds, the Tatars and Calmucs, the Turks and Esquimaux, Australs and Patagonians, nor the more modern systems of the great European States, such as France, Austria, Prussia, Russia, Sweden, Hanover, and Belgium, but will at once proceed to illustrate the British army-tents of the present day. I will endeavour to explain their peculiarities of construction in detail, point out their general defects, call your attention to some very valuable remarks already recorded by professional men, having the object of directing public attention to the necessity of providing efficient coverings for our own troops when encamped in the field, and finally, will bring to your notice a proposed remedy, in

the shape of a new system for constructing curvilinear and other tents, of my own invention.

The object I have in view is to endeavour to apply a practical remedy for an acknowledged and still existing deficiency.

The tents at present adopted in the British army consist of three, viz. :—

First. "The Hospital marquee."

Secondly. "The field-officer's marquee."

Thirdly. "The circular single-poled tent."

The hempen canvas of the hospital tent is supported by two or three vertical poles, of nearly 14 feet each in length, secured together, at their top ends, by a ridge-pole of 18 feet 10 inches long.

When the canvas has been stretched out, and secured to the ground by 184 pegs, (which number includes the 4 large pins to secure the storm ropes) the canvas walls (5 feet 4 inches in height) are hooked on to the bottom edge of the sloping canvas roof, and then pegged to the ground at that part which touches it. The roof and walls of this tent are of double hempen canvas, having a space between each, of about one foot. The inside ground measurement of this tent is 29 feet long, by $14\frac{1}{2}$ feet wide, and as it is understood to afford accommodation for not less than 18 or more than 24 men, it would in the latter case permit of 2 feet 5 inches, by 6 feet 6 inches for each soldier, allowing 18 inches for a passage down the centre of the tent.

This tent, when pitched, covers a space of ground 20 paces by 17, or about 340 square yards.

The weight of these tents, when dry, varies from 428 to 507 lbs., and when wet, from 644 to 676 lbs. Or, in other words, the weight increases about one-third, viz., in the former, the increase is 216 lbs. against 169 lbs. of the latter. (These tents are of different sizes.)

It is thus evident, that if the canvas was effectually rendered waterproof, greater efficiency, and a large saving of transport would be the result. (See the table of sizes and weights of tents in the "Aide Mémoire to the Military Sciences," published in 1845-6.)*

A tent of the above dimensions contains 3,810 cubic feet of air, which would allow of about 275 cubic feet each to 12 men, about 188 cubic feet each to 18 men, and about 137 cubic feet each for 24 men. The hospital marquees are not provided with suitable means of ventilation.

The Field-Officer's Marquee.

This tent is, in shape and arrangement of its details, only an "Hospital marquee" on a reduced scale.

When pitched, it occupies about 126 square yards of ground, or 9 paces by 14; its weight when dry is about 173 lbs., and when wet 244 lbs., being an increase of 71 lbs. (See table of tents in the "Aide Mémoire to the Military Sciences," 1855-6.)*

N.B. This marquee is not much used.

* This useful work has omitted to describe military tents, only giving their respective weights.

The Circular Single-poled Camp Tent.

This tent, with some slight modifications, has been in general use in the British army for about 60 years (if not rather longer). Formerly, the canvas was supported by one centre pole, and without the short vertical wall with which the present conical tents are supplied; its height was 9 feet, its width about 12 feet, and it was capable of holding 12 men.

A complete tent so constructed only weighed 43 lbs.

The following are the dimensions, &c., of the "circular conical single-poled tent" at present in use. (I may premise, by stating, that the British army tents vary in size, and consequently in weight.)

The diameter of this tent is 12 feet 6 inches; height, (or length of pole,) 10 feet 4 inches; accommodation for 12 to 14 men; weight of the linen tent (complete) when dry, is from 68 to 75 lbs., and when wet, about 104 lbs. The height of the vertical circular wall is 12 inches, and its object is to give increased head-room to the soldiers when lying down.

The number of pins required for this tent is 43, viz. 40 for the tension ropes and loops, and 3 for the long storm ropes. This tent is provided with one triangular entrance, and is deficient* of a proper means of ventilation. The above sized tent contains about 512* cubic feet of capacity, allowing to each soldier about 64 cubic feet, 8 men per tent; about 51 cubic feet, 10 men per tent; about 42 cubic feet, 12 men per tent; and about 34 cubic feet, 15 men per tent.

General Defects of the British Army Tents.

Their general defects consist—

1st.—The canvas of which they are made is not always of the best material.

2nd.—The canvas and tent-ropes are not waterproofed; and, owing to their absorption of moisture, the weight of the tent is increased nearly one-third, and by their contraction, when wet, materially assist in pulling the wooden pegs out of the ground, thereby rendering the tent less secure during stormy weather. The alternate saturation, and drying of the canvas and ropes, must materially tend to rot them.

3rd.—Want of an improved method in the construction of the present army tents, from the apparent inability of applying to them an efficacious and simple plan of thorough ventilation, &c., which, from the latter being very defective, together with over-crowding men into a confined space, is, but too often, the chief cause of those zymotic diseases—viz. "fevers," "diarrhœa," "dysentery," and "cholera," which are the greatest enemies to troops employed in active warfare.*

Young lads of 18 to 20 years of age, are much more liable to contract zymotic diseases, than men of 22 years and upwards; the former are generally deficient in physical strength, whereas the stamina of the latter, being more fully developed, their constitutions are better able to bear the harassing fatigues incidental to armies in the field.

* *I*vide Report of Sanitary Commission, 1855—56.

To illustrate the point in question, I may, perhaps, be permitted to briefly mention "that during the campaign of 1809, some troops which were cantoned in the north of Germany marched to Vienna, and, although the distance was only short, all the hospitals on the line of march were filled with sick: more than one-half of these men were under 20 years of age."—Again, "during the year 1805, a French army, which was cantoned in the neighbourhood of Boulogne, marched about 400 leagues to join the grand army in Moravia, prior to the battle of Austerlitz (fought 2nd December); but owing to the more matured physical strength of these men, (all above 22 years of age and 2 years' service,) this long march was accomplished without leaving almost any sick in the hospitals on the line of route."

With respect to No. 1 Defect, I find that the two Commissioners (Sir John McNeill and Colonel Tulloch) reported, in 1855-56, that "some of the tents were of an inferior quality, and that in many instances the army was obliged to use the single-poled camp-tent for hospitals, instead of the marquee, although the latter was far more appropriate for such a purpose."

No. 2 Defect.—I have already called your attention to the increased weight of the army tents when wet; and, with respect to their general deficient waterproof qualities, I can state, from personal experience, that in the autumn of 1848, I was encamped for about two months, with a detachment of my regiment (then 2nd Batt. 60th Rifles), at Kilkenny; and, although the weather was not unusually wet for Ireland, still a misty dew penetrated the canvas, and rendered everything within the tent uncomfortably damp.—During the winter of 1854, when I was in the Crimea, the general complaint of the British army tents was, that they were neither waterproof nor ventilated, and I can well remember the wet and puddled state of the windward half-ground portion of the interior of many of the tents, caused from the incessant beating of the rain and wind against the canvas, which latter was ill adapted to resist the combined action of the rain and wind, for a continuous period of sometimes ten days: on the contrary, the "Turkish Circular Conical Tent" was dry, warm, and waterproof, owing to its covering being of double cotton canvas; besides, from its great width, and comparative lowness, it withstood the fearful hurricane of the 14th of November, when nearly all the British and French tents were blown down. With reference to the deterioration of the tents from the effects of the variation in the weather, I find, on reference to page 123 of the printed "Report of the Sanitary Commission," (despatched to the seat of war in the East, in 1855-56,) that in the month of May, 1855, the Commissioners "recommended the striking and removal of some tents to a fresh surface, owing to the damp state of the ground inside the tents." The Commissioners were informed, that "the supply of tents was deficient, and that it was impossible to strike the tents pointed out, as they were too much decayed to admit of removal."

No. 3. Defect.—With respect to the very important subject of defective ventilation, &c. of the present army tents, I beg to bring to your notice the recorded opinions of several professional men.

The late Dr. Robert Jackson, "Inspector-General of Army Hospitals," states, that "There is great room for improvement in the manner ordina-

rily employed for covering troops from the inclemency of the weather during a campaign." He recommends the use of "a carpet of painted canvas to be laid on the ground inside the tent, and, by preventing the ascent of moisture, generated by the raised temperature within the tent, from its occupation (more particularly by the immediate or near contact of the heated bodies of the men with the surface of the earth), would greatly tend to lessen those evils (arising from the contaminations of the air) to which soldiers are subject, when crowded together in close or unventilated tents."

The doctor recommends "a tent with a light roof," but acknowledges "that the application of it is connected with trouble." He further states, that "a roof, similar to that of a marquee, is liable to be overturned by strong winds, and a tent with close walls is liable to be contaminated."

I must again refer to that valuable "Report of the Sanitary Commission" in respect to the general want of ventilation of our army tents. They state "That the most obvious sanitary defect in the tents was their want of ventilation." "It is usual on a march for 12 to 15 men to sleep under a bell tent. The cubic space for each soldier is 51 to 64 cubic feet, but the consequent evils from overcrowding tents would be greatly mitigated by ventilation. The indispensable necessity of renewing the interior atmosphere of the tent is indeed fully recognised, for there are a few small openings for this purpose, near the apex of the tent, but they are of too small a size to be of use."

"Ventilation."

Again, "We had occasion to examine the ventilation during the outbreak of cholera in May 1855, and were struck on entering the tents by the foulness of the atmosphere. This led to inquiry, and we found the men were perfectly aware of this defect, and complained of it themselves, especially in the mornings."

"At the same date we found instances of sick, being treated under bell-tents,* and in going into one of these, we saw pans of peat charcoal on the floor, and were told by the surgeon, that were it not for the use of charcoal for absorbing the emanations from the sick, the air of the tent would have been unbearable—a very sufficient proof of the great necessity for a better ventilation."

The Commissioners again state, "that to remove as far as practicable the evils of overcrowding tents, it appears indispensably necessary to improve their ventilation." With respect to the sanitary condition of the "Hospital-Marquees," the Commissioners state that "the usual method of ventilation in 'marquees,' is by opening or raising the side walls; but this method can hardly be said to be sufficient, even in favourable weather, and still less is it, when from rain or high wind the sides cannot be opened. Even in the fine weather, it was remarked that the air under the roof of the marquee was hot and stagnant (although the sides were open), because there was no provision for its escape above."

The Commissioners state that "*the whole question of ventilation, as regards field hospitals, is one of very great importance;*" and with respect

* It is to be remarked, that the "bell-tents" here referred to are the "single-poled conical soldiers' tents."

to the rapid recovery of the sick and wounded, they state, that "well-ventilated field hospitals answer much better than would be fulfilled by a much larger amount of ill-ventilated cubic space." Consequently, "to well ventilate a field hospital is, in other words, to save transport." They pointedly remark, that "a permanent and independent means of ventilation is particularly required at night, when the doors and side hangings are closed."

In their concluding remarks they state, "that the atmospheric impurities arising from over-crowding and defective ventilation of tents, and huts, were a frequent predisposing cause of zymotic disease." And that, "as the neglect of the sanitary condition of camps, tents, barracks, and hospitals has hitherto, in all countries, climates, and seasons, been the cause of the largest amount of loss in armies, the whole subject (closely connected as it is with the physical efficiency of Her Majesty's forces) demands in future a *practical development* commensurate with its importance to the public service."

During the last three years and five months of the Peninsular war, at the period when the greatest activity prevailed, the mean strength of the British Army amounted to 61,511 men, and the sick to 13,815, being 22½ per cent. The mean ratio of inefficiency from wounds did not exceed 1½ per cent.

The average strength of the British Army in the Crimea during the ten weeks intervening between the 5th May and 14th July, 1855, was 38,507 men. The total admissions into hospital were 22,541, or 58 per cent. of the force; the per-centage of deaths from wounds (exclusive of deaths in the field) was 20 per cent.; whereas 74½ per cent. admitted into hospital, and 96 per cent. of the total mortality from disease, originated from zymotic cases, such as fevers, &c.

Major Rhodes' Tents.

With the view of supplying a remedy for the several defects of the present army tents, I will now briefly describe some tents of my own invention, not that they being my own merit a greater attention, but that I believe the proposed improvements will materially add both to the health and comfort (in all countries and seasons,) of dwellers in tents, and I further hope, may render "Tents and Tent-Life" more acceptable.

From the diagrams you will perceive that I have applied my system to three forms of tents, in all of which the same principle of construction is embodied.

No. 1 represents the skeleton or uncovered frame of my field-tent, from which you may easily comprehend the simplicity and strength of its construction.

The frame is composed of stout ribs of ash, bamboo, or any other flexible material. When required to pitch the tent, the prepared double-twisted ground rope or band is hooked together, and laid to the full extent of its own circle on the ground; the butt-ends of the flexible ribs are then inserted within the loops or openings already made in the circular rope, and, when the latter has been stretched out to the form required, the butt-end of each rib is forced into the ground (see Diagram No. 2, p. 247); and to facilitate this operation, the extremity of the rib is provided with a metal

shoe in the shape of a wedge. The butt is also provided with stops, so that the twisted rope or band, now circulating round the butt, cannot slip up the rib, nor can the butt be forced into the ground beyond those stops.

To render the ground-rope more secure, a peg is driven over it at the centre point between each rib. The top ends of the ribs (if detached from the butts) are placed into sockets, which latter are secured to the top ends of the butts; the ribs are now gradually bent inwards, and then inserted into the socket-holes of a head prepared for them. The latter has a large hole through its centre for providing top ventilation to the tent. The canvas covering of the tent is then drawn over the frame, and when the outer ventilating head-piece, or hat, covers the inner one, the bottom part of the tent-covering is strapped to the ground-band by means of straps fixed to the inside canvas of the tent, near its base.

No. 1.

No. 3 (see p. 248). The tent is thus complete; but, to add increased stability, eight short outside storm-ropes, previously attached to the canvas, are stretched out, and pegged to the ground. To further add to the firmness of the structure, the outside valise or canvas bag in which the whole tent was rolled up, is divided into two parts, and then secured to the inside of the lower part of the canvas of the tent, to fastenings prepared for that purpose. On that part of the canvas which lies on the ground, are placed the butt-ends of the arms, the knapsacks, and other articles usually required by a soldier in the field; by this extra weight being laid on the canvas ground-curtain at the sides of the tents, all round its base, not only greater stability is given to the tent, but what materially benefits the men in a sanitary point of view, is, that the usual ground currents of air which

enter at the bottom of the tent do not by the above means blow direct on the bodies of the men, thereby obviating the necessity of providing straw to place round the bottom of the tent, which at present is absolutely necessary to prevent the men from getting stiff necks; by this simple arrangement the purchase of straw usually supplied for tents is obviated; and what must be clearly perceived, is, that fewer men are liable to catch cold, consequently the hospitals would be much less incumbered, and the army rendered much more efficient. It is the prevention, and not the cure of such trivial complaints, that should be most attended to. When it is [See p. 250.]

No. 2.—SECTIONAL (ETC.) DETAILS OF MAJOR RHODES' TENTS.

No. 1. Represents outside of the ventilating hat of "Guard," "Field," and "Hospital Tents (top part open)."

„ 2. Inside of ditto, and cord for closing the top part of the ventilating hat.

A 3. Section of the wooden head-piece.

C 4. Side elevation of ditto, showing the iron sockets (L) which receive the top ends of the ribs.

5. Portion of ground-rope, with the butt-end of the tent-rib passed through the rope; also a tent-peg to secure the ground-rope, between each of the ribs.

6. E. section of butt-end of tent-rib, 14 ft. 2 in. long, 2 by $\frac{3}{4}$ in. at butt, 2 by $\frac{1}{2}$ in. at the top. G. cast iron stops, secured with iron screws. H. tent-rib, of ash or other flexible wood or suitable material.

No. 3—MAJOR RHODES' FIELD-TENT.

NO. 4—MAJOR RHODES' HOSPITAL-TENT.

necessary to light a small fire within the tent, the exterior ventilating hat or cover can be opened, so that an easy and free egress for the smoke is obtained.*

With respect to the saving of space, when ground is an object, I can pitch five of my hospital-tents on the same number of square yards of ground, as is required to pitch (including room for the tent-ropes) one Government hospital-marquee—thus, one of the latter requires about 340 square yards of ground (or 20 paces by 19), whilst five of the former only require about 315 square yards of ground. The space necessary for one of my hospital-tents is about 63 square yards, or about 7 paces by 9.

This is a decided advantage when but a small space can be procured for the encampment of troops. My field-tents can, if required, be pitched within a few inches of each other, thereby also occupying much less space than the "circular conical Government tents."

The cube quantity of air contained in my tents is as follows:—

"*Hospital-tent*," 30 feet long, 15 feet wide, and 10 feet high, is equal to 2383½ cubic feet; or about 119 cubic feet for each soldier, having 20 men in the tent; or for 30 men, about 79½ cubic feet each.†

"*Field-tent*," 13 feet diameter and 8 feet high, is equal to 531 cubic feet; or, for 8 men in a tent, about 66½ cubic feet each; and for 12 men, about 44½ cubic feet each.

"*Guard-tent*," 9 feet diameter, and 5 feet in height, contains about 159 cubic feet.

An ordinary "single-poled circular conical tent," without any side walls, but occupying the same space of ground, and of the same height and width as my field tent, contains about 354 cubic feet of air, thus allowing about 44½ cubic feet for each man, 8 men in the tent; and about 29½ cubic feet for each man, 12 men in the tent.

I beg to state that all my tents are perfectly ventilated, and that the government tents are deficient in that most important particular.

The number of cubic feet of air allowed to each soldier in many of the barracks in England is only 300 feet, whereas for prisons the rule is 1,000 cubic feet per individual.

The colour of the canvas of my tents is grey, and that of the Government tents is generally white, or a very light colour. The glare from white canvas is not only very objectionable for the eyes, but is also easily seen from a great distance, thereby often disclosing to the enemy those strategical movements of which, if the colour of our tents were of a dark-grey, he would be ignorant.

In conclusion, I beg to read a few extracts from Official Reports on the "Suitability, &c., of my Tents," as applicable for military purposes, based on Reports of their actual occupation by troops in the field, which his Majesty the King of Hanover has been pleased to grant me.

* Weight of "Field Tent" (13 feet in diameter), when complete, 95 to 100lbs.

† Weight of Army Hospital Tent	.	.	507 lbs.
„ Rhodes' Hospital „	.	.	395 „

In favour of Major Rhodes' Tent	.	.	112 lbs.

EXTRACTS FROM "THE HANOVERIAN GOVERNMENT REPORTS."

COLONEL RICHERS' REPORT.

(Translation.)

To Major and Adjutant-General von Tschirnshütz, Hanover.

CELLE, Oct. 12th, 1858.

In fulfilment of an official request of the 12th ultimo from your Excellency, to his Excellency Lieutenant-General von Dachenhausen, commanding the 1st corps division of the 10th Federate army corps, there were brought me in the camp at Wülfingen, three tents of a new invention of the British Captain Rhodes, with the gracious commands of His Majesty the King, to pitch them in the camp of the Second Regiment of Infantry; to examine them, as to their suitability and durability, and to furnish your Excellency, on return to garrison, with a Report of the information obtained.

Captain Rhodes calls these tents—

"HOSPITAL TENT," called *Tente d'Ambulance* in the French printed paper I received.

"FIELD TENT," *Tente de Campement* in the French print; and

"GUARD TENT," *Tente de Poste ou d'Abri* in the French print.

These three tents differ essentially in their construction from our linen encampment tents, in that the principal support does not consist in the tent pole, but in ribs, the upper part of which is flexible; thus forming a vaulted frame, over which the covering is placed. From this arched shape, the interior space of the tent is much increased from top to bottom; the men can stand upright without difficulty (this is not the case, however, with the very low watch tent), and the middle area of the tents is not diminished by the pole. There is a very useful arrangement within these tents for placing the muskets and accoutrements of the men, which, while but slightly decreasing the interior space of the tent, affords much convenience to the soldier.

This arm-rack sling is composed of two short ropes (each about six inches in length), having a loop-sling and wooden toggle or pin, at alternate ends:—these ropes are fixed to the canvas sides of the tent at about three feet off the ground, but, at the juncture of that part of the canvas which touches the ribs, so that by placing the butt ends of two muskets on the inside ground curtain, at, or close against the butt end of the rib (which has been forced into the ground), and by circulating round the top end of the barrels the two short ropes, and then fastening the latter, the muskets are securely and handily placed upright against the sides of the tent. The accoutrements can be hung over the ropes, between the canvas of the tent and the barrels of the muskets, which, by the projection of the latter beyond the ropes, the accoutrements cannot slip off. Thus, for every two soldiers lodging within the tent, there is one sling, and on account of only two muskets being placed in each loop, the soldiers can readily lay hold of their own arms and accoutrements, even in the dark, without the slightest confusion or delay.

The covering of the tents is of double white cotton canvas, sewed together. During the weather we had at the camp at Wülfingen, the tents were much warmer in the cool of the night than our linen ones, and much cooler than the latter, in the heat of the day. In this respect Captain Rhodes's tents have a twofold advantage over the linen tents of the Government. The pitching and striking of these tents offer no difficulties. The non-commissioned officers and privates under my orders learned the way after once seeing a tent pitched by the armourers (*zeughaus-offizianten*) sent me for that purpose.

Eight men, after very moderate practice, can pitch an hospital tent in from ten to twelve minutes; and four men a field tent in five minutes; the same with a guard tent.

After these general observations, I will proceed to give more special details of each tent.

I.—THE HOSPITAL TENT.

This tent is highly to be recommended for camps. It is 30 feet long, 15 wide, and 10 high, and can conveniently accommodate twenty patients. It has the form of a long oval; and when ten patients lie down on each side of the tent, there is sufficient space left in the middle for a small passage, so that the doctor can reach every patient with ease. As soon as the tent was pitched in the camp at Wülflingen, and furnished with straw, I had it occupied by the camp patients of the regiment, hitherto lodged in straw huts. They all expressed themselves (in reply to my inquiries) much pleased with the change; the head surgeon [Dr. Neuber] also frequently informed me, that the tent was excellent, and by far surpassed the straw huts. There are also slings fastened to the walls of this tent (such as I have previously mentioned) for the purpose of supporting the arms, so that the patient can take all his things with him into the tent without being incommoded.

This "Hospital Tent" (as before observed) differs considerably in shape and size from the field tent. It has a larger exterior expanse and head-room, which not only permits of the soldiers standing upright, but supplies a much purer and larger circulation of air. There is another canvas covering, of blue and white striped cotton stuff, which is stretched over the whole of the interior arch of the tent, so that this tent is provided with a threefold covering; the ingress of heat or cold, is, by this means, very much moderated. There are, moreover, in the upper part of the arch, several ventilating holes, which can be opened and closed at pleasure. By this means, the atmosphere of the tent can be kept perfectly pure, and without inconvenience to the patients; and, as these ventilators are only made through the double canvas covering, and not through the under one, the exterior air, on entering within, and near the apex of the tent, is checked by the third, or inside covering, thus only reaching the interior of the tent with a gentle current. In short, this tent answers every purpose that can be desired for an invalid tent.

II.—THE FIELD TENT.

This tent (or the soldier's camp tent) has also the advantages of its arched shape being better adapted for enabling the soldiers to stand upright than is the case with our present linen tents; that the tent-ribs do not limit the interior space; that the arms, without occupying room, can be strapped or secured to the tent-wall, and that the canvas covering does not allow heat and cold to enter so easily as in our linen tents. Besides the above important points, the tent has another good arrangement, viz., that at the top of the dome there is a ventilating hole, so that when the tent is closed all round at its base, as during the night-time, still there is a continuous current of fresh air, entering at the top of the tent; and in warm weather, when the tent doors are both opened, a cool current of air is obtained: this aperture is protected against the entrance of wet by a leathern hat. I may mention as a further utility, that the ground curtain (with which all the three tents are provided), is a sort of canvas carpet, which is buttoned to the lower part of the canvas inside of the tent, covering about two feet of the ground. This ground curtain is used to place the men's things on, such as their knapsacks, arms, &c., and affords also this advantage, that, by the weight placed on it, it materially assists in maintaining the stability of the tent in stormy weather.

The men whom I placed in this tent scarcely ever required their woollen blankets during the night, while those in the linen tents could not do without them—a proof how very much warmer it was in the former. The men gave a decided preference to this tent over the linen one of the Government.

III.—THE GUARD TENT.

This tent seems intended for active war purposes or outposts only. With the object, probably, of its better escaping the observation of the enemy, it is of grey colour, and so low and small (five feet high by nine feet in diameter), that only about six men can conveniently sit in it. In my opinion, its only use can be to afford alternate shelter in bad weather to men on outpost duty.

(Signed) RICHERS,
Colonel, and in command of the Regiment.

DR. NEUBER'S REPORT.

CELLE, *March 8th*, 1859.

MAJOR RHODES' "Hospital Tent" (*tente d'ambulance*) is 30 feet long, 15 wide, and 10 high, and is of an oval form, and of a vaulted construction. Instead of a tent-pole, wooden bowed ribs serve as a support to the tent. The covering of the tent is composed of double white cotton canvas sewed together. Underneath this canvas covering, there is another composed of blue and white striped cotton, which is stretched over the entire arch of the tent, and is capable of being lowered or raised, according to circumstances. In the upper part of the exterior tent-covering there are two ventilating holes, made to open and shut, which, by reason of the air that permeates through them, keeps the atmosphere between the outer and inside coverings always fresh and pure.

The tent was pitched in the camp of the right wing of the regiment, on a somewhat rising ground, and remained ten days under my superintendence.

The weather was always favourable, although it was hot and dusty during the day, while at night it was often very cool.

The greatest number of patients occupying the tent, at any one time, was 18, of which several had previously been treated in the straw huts.

When hospital accommodation is required for troops in the field (either with reference to the employment of tents or huts), the three following very important points are to be considered:—

"I.—Sufficient light."

"II.—Sufficient accommodation, with as much comfort as possible for the sick, and for the unrestricted movements of the surgeon."

"III.—Purity of the air, and the greatest possible protection against the influence of temperature and weather."

As the above points form the ground of the following report on "Rhodes' Hospital Tent," I take occasion, at the same time, to notice the advantages and disadvantages of the straw hut in these particulars, with the view of corroborating still more my previously delivered opinion, viz. that the former deserves the preference.

I.—SUFFICIENT LIGHT.

The canvas coverings of "Rhodes' Hospital Tent" permit of a thorough, sufficient, and uniform light penetrating through them during the day-time, so that the surgeon has the advantage of being able to make his examinations, and effect every necessary arrangement in any part of the tent in which his patients may be lying, and in whatever position they may be placed.

The strong rays of the sun penetrate the outer and inside coverings of the tent in such a modified form as to neither distress the eyes of the patients, nor incommode the medical officer; on the contrary, in the straw hut, the light fell partially and insufficiently through the window; and, at the examination of the patients, the door was generally obliged to be opened, so that they might be brought near to it. When the door was thus thrown open, it was hardly possible for the surgeon to avoid standing in his own light, which, for example, in dental operations, is an evident disadvantage. In stormy and wet weather, the defective light in the straw hut was of still more serious consequence.

II.—SUFFICIENT ACCOMMODATION, WITH AS MUCH COMFORT AS POSSIBLE FOR THE INVALIDS, AND THE FREE MOVEMENT OF THE MEDICAL OFFICER.

"Rhodes' Hospital Tent" can in case of necessity accommodate twenty invalids (*viz.*, ten on each side), with a space of three feet by six feet six inches for each man. As the invalids lie with their heads near the walls of the tent, and their feet inwards, sufficient space is left in the centre of the tent for a passage through its entire length, from which the surgeon can easily inspect every patient; on the other hand, the invalid can make his way in and out of the tent without disturbing his neighbour. With patients to the number of eighteen, I could reach every man without any inconvenience, and there was still sufficient room for each invalid to have a drinking vessel, &c., placed near him. It is therefore evident that, from the above ample space and arrangements, "Rhodes' Hospital Tent" affords the best shelter hitherto obtained in camp hospitals.

A great advantage is also afforded from the height and vaulted form of the tent, as both the surgeon and patient can move about without stooping; moreover, the patient does not lie under a slanting and narrowing roof (running up to a point over his face), as in the straw hut, and in the ordinary camp tent.

Besides this, each tent-rib (on which the accoutrements of the soldier are hung, without any inconvenience to him) serves as a fixed point for the bed-place of each patient, by which a regular and orderly arrangement for their lying down is easily secured.

These proportions of space (as above-mentioned) belonging to this Hospital Tent, stand out so *prominently*, when compared with those of the straw hut, that no further explanations can be required in this particular.

III.—PURITY OF THE ATMOSPHERE, AND GREATEST POSSIBLE PROTECTION AGAINST THE INFLUENCES OF TEMPERATURE AND WEATHER.

The air in "Rhodes' Hospital Tent" was always pure and wholesome, even in the morning, after the entrances had been closed the night before; it was equally so in the daytime, when the rays of the hot sun fell strongly on the tent.

The construction of this tent, with its system of ventilation, not only permits of a gentle circulation of air within, but also materially contributes in maintaining that air in a pure and wholesome state: on the contrary, in the straw hut, the atmosphere was never so pure and wholesome, and this was more particularly felt in the morning, after the door and window had been closed during the previous night. In connection with this subject, I may observe, that in the straw huts at the camp of Nordstemmen, millions of little flies made their appearance, soiling everything they touched; but in "Rhodes' Hospital Tent," as well as in the other two tents, no trace of them was visible. The temperature in his tent during the heat of the day was higher than in the straw hut, but at the same time was not disagreeable, and never obtained such a degree of heat as in the ordinary simple camp tents. During the cool nights, it was equally as warm in this tent as in the straw hut; but in the latter, the wind blew through every crevice, so that the night-air caused a very perceptible draught: on the contrary, owing to the strong material of which the outside double covering of "Rhodes' Tent" is composed, this current of night-air nowhere penetrated through it, and I have been *repeatedly* assured of this fact by patients who had previously occupied the straw hut. For the more accurate observation of the variations of temperature I required a thermometer, but unfortunately had none.

It is to be observed that the temperature in this tent can be raised by the *lowering* of the inside cover in cold weather, and in hot weather, moderated, by *drawing it up*. I could however make no closer inspection on this point, since the weather continued, as before remarked, sufficiently warm in the tent, even during the night.

With respect to "Rhodes' Hospital Tent" resisting storm and rain, I can form no opinion from personal experience; but I think, from experiments which I made with the straw huts on the Düppler Höhen, and with the simple camp tent in the camp at Lüneburg, I may venture to state, that his Hospital Tent would be more secure against wind and storm than a straw hut, and amply as well against rain.

In conclusion, I must also mention that all the invalids who had occupied "Rhodes' Hospital Tent" spoke in high terms of it in every particular, and repeatedly of their having lived in it; besides, all the patients who had occupied both the straw huts and his "Tent" decidedly preferred the latter.

(Signed) DR. NEUBER,

Head Surgeon in the 2nd Infantry Regiment.

ADMIRAL SAUMAREZ drew attention to the fact that cotton cloth, when saturated, throws off the water, instead of allowing it to pass through; and that that was the great advantage of cotton over linen. He stated that a lieutenant in the navy, observing that air could not pass through saturated cotton cloth, had turned this knowledge to account in making a life-belt, which he found sufficiently strong to support him; that he himself had made one, and that several others had been made on the same principle from cotton cloth, and found to answer perfectly.

STIRLING LACON, Esq. Though cost ought to be no consideration where the health of the men is concerned, will you be kind enough to give us a slight estimate of the cost of a tent constructed on the Government plan as compared with yours, both holding the same number of men?

MAJOR RHODES. The Government single-poled conical tent costs about £3 15s.; a tent of mine, of the same size, would be about £9 9s. or £10 10s., both accommodating the same number of men. Mine is of double cotton canvas, which of course increases the price; and then an extra expense is incurred on account of the ropes and the canvas being waterproofed by the present mode of waterproofing cloth, &c. The tents being covered with double cloth, the interior cloth would take a considerable time before its waterproof qualities would be much deteriorated, on account of the water not often touching it. My tents have been tested in Dublin and elsewhere *during very heavy wet weather*, and those tents were *perfectly dry inside*, during and after very heavy rains, on account of the double cloth. The Turkish soldiers' tents are all covered with double cotton canvas.

STIRLING LACON, Esq. I prefaced my question by saying that the cost ought not to be any consideration where the health of the men is concerned.

MAJOR RHODES. I may be permitted to remark, that, though my small field-tent is more expensive, yet my hospital tents are less costly than the Government hospital marquees, both holding the same number of men.

CHAIRMAN. Major Rhodes has, under an unpretending title, read a very interesting paper. The subject is no less important than interesting, when we consider the fact, (of which we are all aware,) that 80 per cent. of the deaths in the Crimea arose from sickness arising from the want of sanitary arrangements. Of course the difficulty in erecting the tents which have a pole in the middle is very considerable; and, if the men are putting the tent up during a storm, it is often capsized before it is finally erected. In Major Rhodes' tents the covering is not put on till the framework is up, and the covering of the tent is therefore comparatively easy. I think I should begin to build the framework from the top, though perhaps that is not the ordinary way of building; but it appears to me that if the top frames were first inserted in the round top, or head-piece, and then bent, the lower frames would be fixed easily into the ground.

MAJOR RHODES. I have tried it both ways, and I find that the best way is to erect it from the bottom. The frames of the Hospital, and other larger-sized Field-tents, are erected as the Chairman describes.

CHAIRMAN. Of course I do not pretend to be competent to speak as to that. . . . I may add, that Major Rhodes has received a gold medal from the Emperor of Austria in testimony of His Majesty's high approbation of his (Major Rhodes') improvements in tents.