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MADRAS ARTILLERY RECORDS

1861.

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proved himself the best Non-Commissioned Officer in the Corps, (not in any particular Troop or Company,) no matter what his standing, should receive promotion, in preference to one whose only claim may be his seniority.

6. Officers Commanding are directed to see that all men under them thoroughly understand the above.

*A. O. No. 11, 29th. October 1860.*—I. It having been brought to notice that several General Orders and Military Board's Circulars were found deficient among the Records of a Division of the Regiment, on a recent change of Commanding Officers taking place, the Commandant of Artillery, under instructions from Army Head Quarters, directs that no Books of Regulation or Instruction, which belong to a Division of Artillery, be taken away on relief of Troops or Companies, or of Commanding Officers.

2. It is further directed that the completeness or otherwise of General Orders &c. be noticed, in future, in a N. B. at the foot of the Annual Return of Books furnished to the Director Artillery Depôt on the 1st May :—thus,

*N. B.* The Battalion (or Division) is complete with General Orders from \_\_\_\_\_ inclusive, and with the Circular Orders by the Inspector General of Ordnance and Magazines from \_\_\_\_\_, ..... } *If not complete, the deficiencies to be stated in detail.*

ARRIVALS.

1860.	Names.	From.	At.
7th Oct.	Brigadier T. K. Whistler,	Kamptee	St. Thos' Mount.
"	Gent. Cadet Mr. J. S. F. Mackenzie,	} Europe	} Madras.
"	" Mr. A. J. Maclaverty,		
"	" Mr. G. R. Gambier,		
"	" Mr. D. W. Lawrell,		
"	" Mr. A. J. Lavis,		
"	" Mr. F. R. Twynam,		
24th "	Capt. (Bt. Major) J. G. Balmain,	Europe	Madras.

## DEPARTURES.

1860.	Names.	From.	To.
3rd Oct.	Lieut. A. K. Seacome,	} St. Thomas' Mount	Thayetmayo.
4th "	" W. R. C. Brough,		
7th "	Capt. G. B. B. Holmes,	"	Secunderabad.
" "	Lieut. S. Penny,	"	Kamptee.
10th "	Capt. A. J. Ogilvie,	"	Bellary.
13th "	Lieut. T. W. Roberts,	"	Singapore.
31st "	Lieut. Col. E. Brice,	Madras	Rangoon.
" "	Lieut. H. M. Finlay,	St. Thomas' Mount	Thayetmayo.

## PROMOTIONS AND APPOINTMENTS.

1860.	Names.	To.
9th October	Gent. Cadet Mr. J. S. F. Mackenzie,	} Admitted upon the Establishment and promoted to the rank of Lieutenant.
9th "	" Mr. A. J. Maclaverty,	
9th "	" Mr. G. R. Gambier,	
9th "	" Mr. D. W. Lawrell,	
12th "	" Mr. A. J. Lavie,	
12th "	" Mr. F. R. Twynam,	} Is considered to have officiated as Principal Commissary of Ordnance, without prejudice to his own duties, " from 11th to 16th July 1860," and not " from 12th to 16th July 1860," as notified in G. O. G. 24th August 1860, No. 381.
12th "	Captain W. C. L. Baker, Commy. of Ordn. Fort St. George.	
16th October	Lieutenant M. E. S. Lloyd.—To be Deputy Commissioner of Tharrawaddy, from the 3rd August 1859.	
16th "	" A. R. McMahon.—To be Assistant Magistrate of Rangoon, from the 11th May 1860.	
17th "	Lieut. Colonel E. Brice, Horse Brigade Arty. } Appointed to do duty with the 3rd Battalion Artillery, and will join the Head Quarters of the Battalion at Rangoon by the earliest opportunity.	
30th "	2d Captain F. St. G. Græme Probationary Asst. Engineer in the Public Works Department, Nagpore. } Promoted to the grade of Assistant Engineer, 2d Class, with effect from the 19th September 1860.	



## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1860 18th Oct.	Capt. [Bt Maj.] J. G. Balmain.....	D.	3d	C.	3d	To join at Rangoon on return from Europe.
	Capt. C. H. Hutchinson.....	A.	2d	D.	1st	
	" A. N. Scott.....	B.	3d	A.	2d	To do duty at Artillery Head Quarters till further orders.
	" E. W. Dance.....	late promotion		D.	3d	
	" C. Desborough.....	do.		C.	5th	To join via Bombay. To have effect from the 27th September 1860. To join. Will proceed to join his Company at Rangoon, on arrival of the Horses of No. 6 Battery at Thayetmayo, instead of waiting until relieved by Captain Smith. To proceed to join in charge of the Artillery drafts on the Steamer <i>Dalhousie</i> , vice 2d Captain Smith relieved.
	2d Capt. R. L. Playfair.....	C.	2d	B.	3d	
	" E. M. Playfair.....	Horse Brig. Non-Effect.		B.	3d	
	" H. G. Thomson.....	late promotion		Horse Brig. Non-Effect.		
	" J. Stewart.....	do.		F.	H. B.	
	" M. B. S. Lloyd.....	do.		D.	2d	
	Lieut. D. D. Anderson..... <i>Horse Artillery</i> .....	do.		F.	H. B.	
	Lieut. W. S. Hebbert.....	Doing duty Arty. Recruit Depot.		D.	3d	
22d "	" J. G. Pollock.....	do.		B.	3d	
	Capt. [Bt Maj.] J. Babbington..... <i>D. Compy. 4th Battn. Artillery</i> .....	do.		do.		
29th "	Lieut. H. M. Finlay.....	B.	3d No. 5 Horse Battery.	C.	3d No. 6 Horse Battery.	
	" G. Haggard.....	C.	3d and Doing duty Recruit Depot.	B.	3d No. 6 Horse Battery.	

## LEAVE OF ABSENCE IN INDIA.

1860.	Names.	Where and Remarks.
9th October	Lieut. K. J. L. Mackenzie.	Mominabad, in continuation of privilege leave till 8th February 1861.
19th "	Lt. Col. (Bt. Col.) J. W. Croggan.	Madras and Centre Division, in continuation for 3 months.
26th "	Capt. (Bt. Major) J. G. Balmain.	Bengal, on furlough for two months, under the Regulations of 1854.
26th "	Lieut. W. S. Hebbert.	The leave to Bombay granted in G. O. G. No. 402, dated 14th September 1860, is cancelled.

1860,	<i>Name.</i>	<i>Where and Remarks.</i>
30th October	Lieut. E. T. Ouchterlony.	—Nilgiris, from 2nd November 4th Battn. Arty. 1860, till 1st February 1861.

#### ORDERS CONFIRMED.

12th October 1860.

*18th September 1860.*—By the Officer Commanding Mysore Division, appointing Lieutenant F. C. Trevor, Horse Artillery, to officiate as Interpreter to the Dragoon Guards without prejudice to his Regimental duties, vice Captain East 8th Regiment L. C., deceased.

*29th September 1860.*—By the Officer Commanding Northern Division, appointing Captain Nuthall of the Madras Artillery to act (as a temporary measure) as Aid-de-Camp to the Major General Commanding the Northern Division without prejudice to his Regimental duties—To take effect from the 18th September 1860.

#### DEATH.

At Saint Thomas Mount on the 30th October 1860, 2nd Captain S. R. Smith of the Artillery.

Captain S. R. Smith was a Cadet of 1847 and arrived in India 27th June 1847.—Date of Commission as 2nd Lieutenant 11th December 1846 ; as 1st Lieutenant 11th May 1854, and as 2nd Captain 27th August 1858.

Passed examination in Hindoostanee for Officers of Companies 14th October 1850 :—Creditable progress 2nd May 1855 and for General staff 2nd February 1856.

Was Acting Adjutant and Quarter Master 1st Battalion, and Staff Officer Artillery Nagpore Force from 11th to 19th October 1855.

Was 28th. 2nd Captain on date of decease, viz. October 1860.

**RULES ON THE SUBJECT OF STAMPS, AS APPLICABLE TO  
MILITARY ESTATES.**

*G. O. G. No. 463, 6th November 1860.*—The Governor in Council directs the publication of the following Rules on the subject of Stamps, as applicable to Military Estates.

1. All parties who receive payments from the Administrator General, whether as Creditors, Legatees, or entitled in distribution, are bound to give Receipts with the proper Stamps, either impressed or affixed.

2. When money once comes into the custody of any Officer of Government, whether Administrator General, Military Secretary, Accountant General, or Sub Treasurer, for the benefit of, or on account of, an Estate, it must be considered as in the custody of Government until the Administrator General pays it over to the party entitled, whether in distribution, or as Creditor or Legatee.

3. When money is transferred from one Officer of Government to another,—merely changing the custody, or rather the person or title where such custody is, Stamp duty is not payable upon such transfers,—but in all cases where any ordinary Executor or Administrator would be bound to give a Stamped Receipt, as for half yearly interest on Government Promissory Notes or the like, then the Administrator General is bound to give one also.

4. When the Administrator General *makes* payment, the person receiving the same must bear the expense of the necessary Stamp, when he receives payments he must give a properly Stamped Receipt, charging the value of the Stamps to the Estate receiving such payment.

**OFFICERS AND SOLDIERS DETACHED ON COURT MARTIAL  
OR OTHER TEMPORARY DUTY, TO STATIONS WHICH  
CAN BE REACHED BY RAIL, TO PROCEED THEREBY AT  
THE PUBLIC EXPENSE.**

*G. O. G. No. 464, 6th November 1860.*—In accordance

with Para. 43, Section V of the revised Pay Code,\* and the provisions of G. O. G. No. 45 of

\* About to be published. 1857, the Honorable the Governor in Council directs that Officers and Soldiers, European and Native, serving at Stations contiguous to the Line of Railway, when detached on Court Martial or other temporary duty, to Stations which can be reached, by Rail, shall be required to proceed thereby at the public expense, and will not be entitled to travelling batta. Native Troops on such occasions are not allowed to take their families, and will not be entitled to Batta.

Orders for travelling by Rail on these duties will be obtained from the Quarter Master General of the Army, or competent local authority, under instruction from Army Head Quarters—the requisition for attendance being attached to the order as a voucher.

#### REGULATING HORSE ALLOWANCE TO OFFICERS OF HORSE ARTILLERY AND HORSE FIELD BATTERIES.

G. O. G. No. 471, 9th November 1860.—With reference to G. O. G. 6th October 1857, No. 316, the Honorable the Governor in Council is pleased to notify that, when, through the exigencies of Field Service, Officers belonging to Horse Field Batteries, are with their Companies temporarily detached from their Battery for Service with a Siege Train, they may be permitted to retain Horse Allowance during such Service, so long as there is no double payment of the Allowance, *i. e.*, so long as the Horse Battery left behind is not attached to any other Company, the Officers of which would thereby become entitled to Horse Allowance.

2. Under other circumstances than those noted in the preceding para. Officers of a Horse Field Battery, in like manner with Horse Artillery Officers, forfeit Horse Allowance when doing duty with dismounted Artillery.

**ORIGINAL WILLS TO BE FORWARDED TO THE MILITARY SECRETARY TO GOVERNMENT, IN ALL CASES WHERE THEY MAY APPEAR TO REQUIRE SPECIFIC INSTRUCTIONS FOR DISPOSAL.**

*G. O. G. No. 472, 9th November 1860.*—An instance having recently occurred of an incorrect copy of a Testamentary document being forwarded to the Military Estate Department, the Governor in Council is pleased to direct that in future, in all cases where Wills may appear to require specific instructions for disposal, the *original Will* shall be forwarded, accompanied by the prescribed certified copies *in duplicate*, to the Military Secretary to Government. When no longer required, the original Will, will be returned if necessary to the party forwarding it.

2. In all cases where it may be necessary to transmit original Wills to the Military Secretary, they will be forwarded as "*Registered letters*" (duly franked)—the Registration fee being chargeable to the Estate.

4. His Excellency the Commander in Chief is requested to issue instructions for a copy of this order being furnished for the guidance of Committees of Adjustment on all Military Estates of Her Majesty's Indian Forces.

**SUBSISTENCE MONEY AND BARRACK ACCOMMODATION TO SOLDIERS WIVES AND CHILDREN, ON ARRIVAL IN INDIA, AND OF SOLDIERS DYING ON FOREIGN SERVICE.**

*G. O. G. No. 478, 13th November 1860.*—The following General Order by His Excellency the Governor General of India in Council, is republished.

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William, 30th October 1860.*

No. 1069 of 1860.—His Excellency the Governor General in Council is pleased to direct that Subsistence Money and Barrack accommodation shall be allowed, for a period not exceeding six months, to all Soldiers' wives and children

who from any cause find, on their arrival in India, that they have no claim to the ordinary pay and privileges of Soldiers' families; and in the case of the family of a Soldier who may die on Foreign Service, the period of six months shall be held to commence from the date on which his family may be made acquainted with his decease.

**MEN TRANSFERRED TO THE PENSION ESTABLISHMENT TO BE FURNISHED WITH HIS PENSION TICKET BEFORE QUITTING HIS CORPS.**

*G. O. C. C. No. 115, 10th November 1860.*—Commanding Officers will be held strictly responsible that no man transferred to the Pension Establishment under the operation of *G. O. C. C. 26th ultimo, No. 108*, quits his Corps until he has been furnished with his pension Ticket.

**OFFICERS RETURNING FROM EUROPE, TO PRODUCE THE LETTER OF THE MILITARY SECRETARY PERMITTING THEM TO RETURN TO THEIR DUTY.**

*G. O. G. No. 480, 16th November 1860.*—The following Extracts from Military Despatches from the Right Honorable the Secretary of State for India, are published.

*Despatch dated 22nd December 1859, No. 184.*

1. "Officers returning will not hereafter be furnished with a Certificate of their having been granted permission to return to their duty. They will be required to produce at the Brigade Major's Office at each Presidency the letter of the Military Secretary informing them that they have the permission of the Secretary of State in Council to return to their duty."

2. "Information of the permission to return granted to each Officer will be duly communicated to the respective Governments as heretofore."

**REGULATIONS REGARDING MEN TRANSFERRED TO THE PENSION ESTABLISHMENT.**

*G. O. G. No. 486, 20th November 1860.*—The Governor in Council directs that, in lieu of the authenticated copy of

the Pension Certificate required by the rule in the Pay Code Section 16, Page 273, head "Abstracts" para. 1. noted in the margin to be attached to the

*first Abstract for Pay to Pensioners at their first Station, and—on change of residence or transfer from one Station to another—at the new Station, a Certificate exhibiting the Class of the Pensioner and the Head of Account to which the Pension is chargeable be, in future, attached to the first Abstracts in such cases.*

2. The attention of Officers Commanding Corps, Heads of Departments, Paymasters, &c., &c., is called to the instructions laid down in G. O. G. 5th September 1851, No. 169, for effecting the early adjustment of the accounts of men transferred to the Pension Establishment, and furnishing them with the usual Passport and Pay Certificate, to enable them to proceed without delay to their Pension Stations and obtain their stipends on arrival; and they are particularly enjoined to observe the same.

3. With the view of saving Pensioners proceeding to their *first Station* from privation and inconvenience, while on route, paragraph 8 of the G. O. referred to, authorises Paymasters through whose ranges they may pass, to disburse to Pensioners under such circumstances such amount of Pension Pay, as may be due in arrears, notifying the same on the back of their last Pay Certificate or Passport (as the case may be), for recovery on the first issue of Pay on Abstract.

4. The authority conferred on Paymasters, as mentioned in the preceding para, will be considered applicable also, when there may be no Paymaster at the Station or in the vicinity, to Commanding and Station Staff Officers, or Officers (Military or Civil) in charge of Pensioners at Stations on the Pensioner's route.

5. His Honor in Council further directs that the arrears due to Pensioners on arrival, or accruing to them, at their *first Station*, be paid to them and adjusted in the manner

specified in para. 3 of this order, until they are furnished with the regulated Pension Tickets. This order will also apply to Pensioners selecting, for their future residence, the station where they may be located at the time of their transfer to the Pension Establishment.

6. The Superintendent of Pensions will, at the same time, use his best endeavours for the speedy preparation and despatch of the pension Certificates to the paying Officers, in order that there may be no undue delay in the issue of Pension Tickets to the Pensioners.

**REGULATIONS FOR SUBMITTING CLAIMS TO COMPENSATION FOR THE LOSS OF KITS.**

*G. O. C. C. No. 119, 21st November 1860.*—In submitting claims to compensation for the loss of Kits under the provisions of the General G. O. G. No. 77, dated 16th March 1855. Order as per margin, it is to be borne in mind that Compensation is admissible to such extent only as will enable the claimant to re-equip himself for service according to the scale of Regimental necessaries laid down.

2. Compensation cannot be admitted for articles with which men may have provided themselves in excess of the regulated Kit—Committees should therefore ascertain and record on their Proceedings in a tabular form, the number of each Article of Regimental Equipment that each Claimant had remaining after sustaining the losses for which Compensation is claimed, and the number of each article that had to be provided to complete the Kit to the established Scale.

**MAGISTRATES NOT TO BE APPLIED TO FOR PROVISION OF CARRIAGE FOR TROOPS ORDERED TO MARCH, UNTIL ALL MEANS ADOPTED BY THE MEN, THE COMMANDING OFFICER AND COMMISSARIAT DEPARTMENT HAVE FAILED.**

*G. O. C. C. No. 121, 26th November 1860.*—The Commander in Chief directs it to be notified, that on the authority



of Government, it has been determined, with reference to G. O. G. No. 166 of 1856 para. 14, that the Magistrate is in no case to be applied to, for the provision of carriage for Troops ordered to march, until all means adopted by the men themselves, the Commanding Officer and the Commissariat Department for that purpose, have failed.

*A. O. No. 12, 6th November 1860.*—I. With a view to remedy, as much as possible, the inconvenience and delay occasioned by the present mode of transmitting from Troops and Companies of Artillery, to Artillery Head Quarters, the Annual Returns of Stores, Committees of Survey, Half Yearly Returns of Ordnance, and Monthly Lists of Receipts, Issues, and Remains, which now require the countersignature of the Brigade or Battalion Commanding Officers, the Brigadier Commandant of Artillery, in directing the adoption of the following system, requests the *particular* attention of Officers Commanding Artillery at Stations to the importance of Officers Commanding Troops and Companies being careful in respect not only to accuracy, but also to the timely despatch of these documents.

II. These documents, when completed by Officers Commanding Troops and Companies, will be countersigned by Officers Commanding Artillery at Stations, and transmitted by them to the Officer Commanding the Artillery in the Division, by whom also they will be countersigned and transmitted without delay to the Director of the Artillery Depôt.

III. The strictest attention is enjoined to the following points connected with these Periodical documents.

1st. That one correct Nomenclature should be shewn in the monthly Lists and Vouchers.

2nd. That all entries in the monthly Lists whether of Receipts or Issues should be supported by the necessary Vouchers duly countersigned.

3rd. That the periodical Returns should be transmitted within the prescribed period.

4th. That Special Committees should be convened for verifying the stores in use with Troops and Companies whenever there may be a change of Commanding Officers, the entire responsibility subsequently devolving on the relieving Officer for any deficiencies not accounted for in the Proceedings of the Committee.

5th. That Committees of Survey should be assembled on the 30th April of each year, and that the Proceedings should invariably be transmitted with the Return furnished Annually.

IV. Officers are warned that in the case of Audits on their Periodical accounts, if they do not retransmit the audits with their explanation within 14\* days of the receipt of the audit, which is always to be recorded above the heading in the space assigned for that purpose, they are liable to be retrenched the value of any objection, which will only be removed should subsequent explanation prove satisfactory.

\* G. O. G. 23rd August 1836.

*A. O. 8th November 1860.*—I. The Commandant of Artillery having reason to believe that so much of para. 26 of A. O. ~~1111~~ of 20th March, as refers to Commissioned Officers, is either lost sight of, or but imperfectly understood, calls the particular attention of all Commanding Officers thereto, and desires them to bear in mind, that it is their bounden duty to bring to notice, in the manner therein directed, all occurrences affecting, in any way, either the personal or professional character of Officers under their command, in order that the Commandant may be able, at all times, to afford His Excellency the Commander in Chief all the information which, as head of the Regiment, he should possess in connexion with any of its Members.

*A. O. 9th November 1860.*—I. The Commandant of Artillery directs the publication, in Madras Artillery Orders,

of the following extract from a letter from the Adjutant General of the Army, No. 5954 dated 24th September 1860.

“ Stable duties His Excellency observes are, as much as any other, an important element in the Drill and instruction of an Artillery man.”

*A. O. No. 13, 28th November 1860.*—I. The Commandant of Artillery directs the publication of the following for general information and guidance of Officers of the Corps.

#### MEMO: ON DRESS.

*Dress.*—The Dress of the Madras Artillery is that of the Royal Artillery, (without Mottoes and Badges,) substituting Madras for Royal, and M. for R., wherever required. *G. O. C. C. 23rd March 1859.*

*Exceptions.*—Peaks of Forage Caps recently abolished in the Royal Artillery to be worn, until further orders, in the Madras Artillery. *A. O. 15th October 1860.*

Cocked Hats not required to be worn by Quarter Masters of Horse Brigade or Battalions—*Memo: 664, 4th June 1859.*

*Belts.*—Waist Belt to be worn over the Dress and Khakee Tunic, but under the Frock Coat and Jacket. *A. O. 17th December 1859.*

*Waistcoats.*—A Scarlet Waistcoat permitted to be worn by His Excellency the Commander in Chief. *A. O. 1/6 of 26th January.*

Drawings have been circulated—no other pattern permitted.

White Waistcoats with open Collar may be worn at Mess. *Circular Memo: 18th October 1860.* *White Trowsers.*—May be worn off duty. *Circular Memo: 13th July 1860.*

*Khakee.*—To be worn as the Undress in the hot season, and entire. Flap of Cap cover down *between* saluting hours, and to be removed *during* saluting hours.

*Exception to Khakee being entire.*—Cap cover may be worn at Mounted Parades, or Artillery Practice.

*Helmets.*—May be worn with any Undress, or on any duty, between saluting hours, and invariably with chin strap down.

*Stocks.*—To be worn invariably with buttoned up clothing, and to be at all times visible—no shirt collar to appear.

*Chin straps of Forage Caps.*—To be worn up on Foot Parades and all other occasions, and down on Mounted Parades only.

*Horse appointments—Saddlery.*—Those Officers who have provided themselves with Horse appointments and Saddlery of the Royal Artillery pattern are permitted to use them.  
A. O. 11th October 1859.

*Full Dress.*—Busby, Jacket for Horse—Tunic for Foot, Dress Trowsers, Boots, Brass Spurs, Sword, Pouch and Belts, Sword Knots, White leather Gloves, and Stock. Sabretache for Officers of Horse Artillery, and for Adjutants of Foot Artillery.

*Undress.*—Forage Cap, Stable Jacket, Stock, Cloth Trowsers, Boots, Steel Spurs, Sword, Pouch and Belts, Sword Knot, White leather Gloves. Sabretache for Officers of Horse Artillery, and for Adjutants of Foot Artillery.

Khakee entire in season.

*Exceptions.*—Helmet to be worn at Marching order Parades, mounted or dismounted.

Pouch and Belt not to be worn at Adjutant's or Recruit's Drills, or with Khakee Tunic, except by Officers on duty.

#### DRESS TO BE WORN ON PARTICULAR OCCASIONS.

*Full Dress.*—At Levees, Funerals, Dress Parades, General Courts Martial, (unless otherwise ordered,) and on such other occasions as may be directed from time to time.

*Undress.*—At all Parades, (Church and Stable excepted,) mounted or dismounted, Minor Courts Martial, Committees and Courts of Inquiry.

*At Church.*—At Morning Service Officers to appear dressed as the men, but with Swords always. At Evening Service Frock Coat, White or Cloth Trowsers, or Khakee according to season.

*At Mess.*—Stable Jacket, Scarlet Waistcoat, Cloth Undress Trowsers:—White Jacket, White Waistcoat, White Trowsers, Boots and Steel spurs. Mixed or entire as may be ordered.

With open Jacket, Neck Ties and Collars may be worn.

Dress Spurs and Dress Trowsers may be worn at Evening Parties.

*Stables (Evening.)*—Frock Coat, White or Cloth Trowsers, or Khakee.

*Evening Rides.*—Frock Coat, White or Cloth Trowsers, or Khakee.

*Visiting.*—Frock Coat, White or Cloth Trowsers,—not Khakee as a general rule.

*The Officer on duty.*—Will at all times appear in the Undress of the season:—at Mess he is permitted to wear Stable (or White) Jacket, and White Trowsers in hot weather; but not Khakee.

As Local circumstances and differences of climate render it inexpedient to lay down one rule for adoption at all stations, Officers Commanding Divisions of Artillery will issue orders for the Dress to be worn, and they are to see that the strictest uniformity, in every particular, is observed by all Officers under their command, one with another, as to the time and mode of wearing each description of Dress.

The different patterns and drawings of Dress have not been received; but all previous orders, as to the times and occa-

sions for wearing particular descriptions of Dress, are cancelled.

A. O. No. 14, 29th November 1860.—I. Applications to the Director of the Artillery Depôt, for Blank Printed Forms, by Officers Commanding Troops, Companies, and Detachments of Artillery, except for those referred to in the

\* Lithographed Forms authorized to be supplied gratis by Government, Minutes of Consultation 13th August 1839.

margin\*, must be forwarded postage prepaid, and not "On Her Majesty's Service."

## ARRIVALS.

1860.	Names.	From.	To.
11th Novr.	2nd Capt. W. D. Forster.	Europe	Madras.
11th "	Lieutenant J. Hoyes	"	"
25th "	2nd Capt. (Bt. Major) L. Bridge	"	"
" "	2nd Capt. J. Stewart	"	"

## PROMOTIONS AND APPOINTMENTS.

1860. Names. To.

6th Novr. Senior Lieut. F. L. Playfair.—To be 2nd Captain; date of Commission, 31st. October 1860.

*Memorandum.*—Lieutenant W. Bisset. is entitled to the pay of his Rank from 31st October, 1860, in succession to Playfair, promoted.

16th " Lieutenant T. I. M. } Appointed to officiate as Deputy  
Hog Asst. Commr. of } Commissioner of Dumoh, as a  
Jubbulpore. } temporary arrangement.

30th " Capt. (Bt. Major) J. G. Balmain.—To be temporarily an Additional Deputy Commissioner for the Province of Nagpore.

30th " Captain C. Elliot, C. B.—To be Deputy Commissioner of the 1st Class at Raepore, in the Nagpore Commission.

## REMOVALS AND POSTINGS,

1860. Names. From. To.

19th Novr. Captain B. C. Hitchins B. Com. 4th Battn. 5th Battn.—To join and do duty with the Head Quarters of the Battn. at St. Thomas' Mount.

1860.	<i>Names.</i>	<i>From.</i>	<i>To.</i>
27th Nov.	C. Com. 1st Battn. with Battery.	Bellary	Cannanore.
	‡ C. Com. Gun Lascars attached to C. Com. 2nd Battn. Artillery.	Trichinopoly	Rangoon
	‡ G. Com. Gun Lascars attached to C. Com. 1st Battn. Artillery.	Bellary	do.
	‡ B. Com. Gun Lascars attached to D. Com 1st Battn. Artillery.	Rangoon	Cannanore.
	‡ H. Com. Gun Lascars attached to D. Com. 4th Battn. Artillery.	do.	Trichinopoly.

## LEAVE OF ABSENCE IN INDIA.

1860	<i>Names</i>	<i>Where and Remarks</i>
30th Novr.	Capt. (Bt. Major) J. G. Balmain.	The leave granted in G. O. G. No. 450, dated 20th October 1860, is cancelled.

## LEAVE OF ABSENCE IN EUROPE.

1860	<i>Names,</i>	<i>Remarks</i>
13th Novr.	2nd Capt. (Bt. Major) L. Bridge,	Leave extended for 1 month.
	Captain J. de C. Sinclair, „ „ „	6 months.
	Lieutenant A. P. Bainbridge, „ „ „	4 „
27th „	Captain C. H. Hutchinson, „ „ „	3 „

## EXAMINED IN THE HINDOOSTANEE LANGUAGE.

1860.		
21st Novr.	Lieut. A. M. Rawlins, } „ P. M. Rolland, }	Passed the examination prescribed for Officers of Companies.

## CONTINGENT GUN ALLOWANCE.

G. O. G. No. 491, 7th November 1860.—The Honorable the Governor in Council is pleased to direct that the following Statement, exhibiting the names of Officers, and the periods they served in the Bengal and Saugor Territories, during which they are specially entitled under the orders of the Supreme Government, to share in the Contingent Gun

Allowance, under the rules of the Bengal Presidency, be published in General Orders:—

*Distribution Details.*

A. Troop Madras Horse Artillery.	} Share to each Troop or Company being 2,248-12-0.
½ E. do. do.	
F. do. do.	
A. Company 3rd Battalion Artillery.	
D. do. 3rd do.	
A. do. 4th do.	
B. do. 4th do.	
C. do. 5th do.	

Computation amount of Contingent Gun Allowance...Rs. 20,873 11 2  
 Deduct Cost of materials and workmen employed in the repair of Ordnance and Carriages as per Statement from the Inspector General of Ordnance and Magazines.....Rups. 3,872 9 8

Amount of Bills already passed by the above Functionary on the above account. Rupees. 135 6 6  
 4,008 0 2

Balance to be distributed...16,865 11 0

Names.	Amount of Share to each Officer.	Total Amount of each Troop or Company.
<i>A. Troop Madras Horse Artillery.</i>		
Captain (Lieut. Col.) J. D. Mein, from 11th March to 23rd November 1858, and from 10th January to 31st March 1859, 339 days.....	1,063 3 5	
2nd Captain R. G. F. Henegan, from 24th November 1858, to 9th January 1859, and from 1st April 1859, to 25th February 1860, 378 days.....	1,185 8 6	
		2,248 11 11
<i>½ E. Troop Madras Horse Artillery.</i>		
2nd Captain (Brevet Major) L. Bridge, from 25th August 1857, to 4th April 1859, 1 year and 223 days.....	757 4 11	
Lieutenant J. C. Taylor, from 5th April to 3rd October 1859, 182 days.....	234 6 5	
Lieutenant H. G. Pritchard, from 4th October 1859, to 14th January 1860, 103 days.....	132 10 6	
		1,124 5 10
<i>F. Troop Madras Horse Artillery.</i>		
Lieutenant Colonel E. Brice, from 12th February to 7th May 1858, 85 days.....	259 5 7	
Captain G. B. B. Holmes, from 8th May to 27th August 1858, 112 days.....	341 11 9	



Names.	Amount of Share to each Officer.	Total Amount of each Troop or Company.
Lieutenant J. Stewart, from 28th August to 8th October 1858, 42 days.....	128 2 5	
2nd Captain R. G. F. Henegen, from 9th October to 21st November 1858, 44 days.....	134 4 0	
Captain W. C. F. Gosling, from 22nd November 1858, to 2nd January 1860, 1 year and 42 days.....	1,241 13 6	
Lieutenant G. A. Goldingham, from 3rd to 16th January 1860, 14 days.....	42 11 5	
Captain H. T. Moleworth, from 17th January to 18th February 1860, 33 days.....	100 11 0	
<i>A. Company 3rd Battalion Artillery.</i>		2,248 11 8
Captain (Lieut. Colonel) G. S. Cotter, from 12th June to 26th October 1857, and from 11th January to 26th February and from 20th March to 31st May 1858, 257 days.....	592 11 11	
2nd Captain G. G. J. Campbell, from 27th October 1857, to 10th January and from 27th February to 19th March and from 1st to 25th June 1858, 122 days.....	281 6 1	
2nd Captain W. J. Bradford, from 26th June to 27th August 1858, 63 days.....	145 4 10	
Captain (Lieut. Colonel) R. Cadell, from 28th August 1858, to 11th February 1860, 1 year and 168 days.....	1,229 5 0	
<i>D. Company 3rd Battalion Artillery.</i>		2,248 11 10
Captain A. C. Jones, from 16th November 1857, to 19th October 1858, 338 days.....	1,428 11 5	
Captain C. H. Hutchinson, from 20th October to 19th November 1858, 31 days.....	131 0 6	
Lieutenant R. A. Baker, from 20th November 1858, to 18th February 1859, 91 days.....	384 10 5	
Lieutenant H. P. Lane, from 19th February to 1st May 1859, 72 days.....	304 5 5	
<i>A. Company 4th Battalion Artillery.</i>		2,248 11 9
Captain R. Kinkead, from 19th January to 21st March 1858, and from 29th January 1859, to 9th February 1860, 1 year and 74 days.....	1,285 6 8	
Lieutenant R. Pope, from 22nd March to 15th June 1858, 86 days.....	251 13 0	
Captain C. H. Harrison, from 16th June to 23rd November 1858, 161 days.....	471 6 8	
Lieutenant C. Johnson, from 24th November 1858, to 28th January 1859, 66 days.....	193 4 0	
Lieutenant E. T. Ouchterlony, from 10th to 25th February 1860, 16 days.....	46 13 7	
<i>B. Company 4th Battalion Artillery.</i>		2,248 11 11
Captain H. E. Hicks, from 21st March to 28th June 1859, 100 days.....	754 9 9	
Lieutenant F. H. Thompson, from 29th June to 20th August 1859, 53 days.....	399 15 1	
Lieutenant A. M. Rawlins, from 21st August 1859, to 9th January 1860, 142 days.....	1,071 8 9	
Lieutenant W. Bryden, from 10th to 12th January 1860, 3 days.....	22 10 2	
		2,248 11 9

Names.	Amount of Share to each Officer.	Total Amount of each Troop or Company.
<i>C. Company 5th Battalion Artillery.</i>		
Captain S. Rippon, from 17th August to 23rd October 1857, 68 days.....	177 12 11	
Captain (Lieut. Colonel) R. Cadell, 24th October to 22nd December 1857, and from 4th January to 20th August 1858, 289 days.....	755 10 11	
2nd Captain C. Desborough, from 23rd December 1857, to 3rd January and from 21st August 1858, to 7th June 1859, 303 days.....	792 4 8	
Lieutenant H. P. T. McCarthy, from 8th June to 7th July and from 7th October to 24th December 1859, 169 days.....	285 0 2	
2nd Captain J. R. J. Robertson, from 8th July to 6th October 1859, 91 days.....	237 15 2	
		2,248 11 10
Rupees.....		16,865 8 6
Lost by Fractions.....		0 2 6
Total Rupees.....		16,865 11 0

The undermentioned Officers having already drawn the Contingent Gun Allowance set opposite their names, a corresponding amount should be recovered from their respective shares and credited to Government.

2nd Captain (Brevet Major) L. Bridge, ½ E. Troop Madras Horse Artillery.....	171 4 7
Captain (Lieut. Colonel) R. Cadell, A. Company 3rd Battalion Artillery.....	480 0 0
2nd Captain C. Desborough, C. Company 5th Battalion Artillery.....	232 4 1
Lieutenant H. P. T. McCarthy, (drawn by Lieutenant Shaw, 27th Regiment N. I.,) C. Company 5th Battalion Artillery	120 0 0
2nd Captain J. R. J. Robertson, C. Company 5th Battalion Artillery.....	160 0 0

2. The Honorable the Governor in Council is pleased to direct that the balances due on account of Contingent Gun Allowance be discharged accordingly by Paymasters under the orders of the Military Auditor General.

#### CLAIMS OF SOLDIERS TO KIT OR KIT MONEY, FROM WHAT DATE ADMISSIBLE.

*G. O. C. No. 136, 12th December 1860.*—The Commander in Chief directs it to be notified, that it was ruled by Government under date 17th August 1860, that the claims of Soldiers to Kit or Kit money under the provisions of

\* Republished in G. O. G. No. 364, dated 20th September 1859.

\*G. O. G. G. No. 1242, dated 1st September 1859, are admissible only from the date of that order.

**SOLDIERS RE-ENLISTING IN H. M. INDIAN FORCES WITHIN 6 MONTHS FROM DATE OF DISCHARGE TO COUNT PREVIOUS SERVICE.**

*G. O. C. C. No. 129, 17th December 1860*—The Commander in Chief with the sanction of Government, directs the republication of the following Extract from General Orders by the Right Honorable the Commander in Chief in India, the provisions of which are made applicable to the Madras Army.

*Adjutant General's Office, Simla, 22nd September 1860.*

In continuation of G. O. dated 16th March last, it is notified for guidance, that Soldiers, who may re-enlist in H. M.'s

Indian Forces within 6 months from the date of their discharge from the British Army will be allowed to count their previous service towards Good Conduct Pay and other advantages, provided they declare their previous service on re-enlistment.

2. Under the authority of Government, the provisions of the above order are applicable to men of the Local European Regiments re-enlisting, and without the reservation in regard to the probationary period of one year prescribed by para. 14, page 87 of the General Regulations.

**REGARDING THE GRANT OF LEAVE TO REGIMENTAL OFFICERS DURING THE DRILL SEASON.**

*G. O. C. C. No. 130, 17th December 1860*—With reference to \*G. O. C. C. No. 32, dated 27th August 1849, the Commander-in-Chief directs that except in very urgent cases, which are to be specially reported, leave be not granted by Officers Command-

\* Regarding the grant of leave to Regimental Officers during the Drill Season:

ing Divisions at this period of the year, nor until the 1st March annually.

*A. O. 5th December 1860.*—II. The Commandant of Artillery directs the publication, in Madras Artillery Orders, of the following letters on the subject of classification of Soldiers, for information and guidance.

No. 9086.

To,

*The Brigadier Commandant Madras Artillery.*

SIR,

I have the honor, by order of the Commander in Chief, to acknowledge the receipt of your letter\* dated 24th ultimo No. 1725, and to inform you, with reference to the questions therein submitted.

\* Submitting certain doubtful points which appear to exist as to the interpretation of G. O. C. C. dated 27th February 1860 on the subject of classification of European Soldiers.

1st. That a man of the 1st class cannot be disgraced for an offence under the 1st Head—The terms “certain crimes hereafter specified,” which occur previous to the enumeration, might admit of a different construction if they stood alone, but the explanation which follows the enumeration leaves no doubt—The above construction is consonant with the general spirit of the order.

2nd. That the “&c.” after “repeated acts of making away with necessaries” is clearly intended to obviate further enumeration of articles, the making away with which involves an offence of the same complexion as those particularized, and does not include *other offences* repeated.

3rd. That convictions by Court Martial of an offence under the 2nd Head, alone disgraces. It is an inconsistency to suppose the crimes of a very serious description, enumerated under the 2nd Head, susceptible of being dealt with by summary punishment.

4th. That the year of uninterrupted good conduct should date from expiration of punishment;—such construction is

in accordance with the principle of G. O. C. C. 29th September 1855 No. 53, and with letter of the Deputy Adjutant General Horse Guards to Lord Clyde of the 29th May 1860, at page 209 of G. Os.\* of 1860, \* Queen's. copy of which is enclosed.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE, } (Signed) W. G. WOOD, Lieut.-Col,  
 FORT SAINT GEORGE, } Adjutant General of the Army.  
 1st December 1860.

HEAD QUARTERS, CALCUTTA, 25th July 1860.

The following copy of a letter from the Deputy Adjutant General Horse Guards, is published for general information and future guidance.

HORSE GUARDS, S. W., 29th May 1860.

MY LORD,

In reply to your Lordship's letter of the 17th April last, the enclosures to which are herewith returned, relative to the application of the General Orders dated Horse Guards 19th and 25th November 1859, I have it in Command to inform your Lordship that all Soldiers are to be placed in the 1st class, without reference to the period they may have been convicted of any offence, who have been clear of the Regimental Defaulter Book for one year after the expiration of their punishment; except in cases where loss of future service has been awarded, when the probationary year is to date from and after the restoration of such forfeited service.

I have &c.

(Signed) W. F. FOSTER,  
 Deputy Adjutant General.

To,

GENERAL THE LORD CLYDE, G. C. B.,  
 Commander-in-Chief in India.

BY ORDER OF HIS EXCELLENCY THE COMMANDER IN CHIEF.

(Signed) E. HAYTHORNE, Colonel,  
 Adjutant General H. M. Forces in India.

A. O. 12th December 1860.—II. The Commandant of Artillery directs the publication in A. O. of the following extract from the Proceedings of Government.

MILITARY DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following:—

*Extract from a Military Despatch from the Right Honorable the Secretary of State for India; India Office, London, 24th October 1860, No. 159.*

3. The undermentioned Officers have undergone a course of instruction in the Drill and practice of the Armstrong Field Gun, and are duly qualified to act as instructors, viz.

\*             \*             \*             \*

Major J. G. Balmain, Madras Artillery.  
 Captain E. W. Dance,            ,,  
 Lieutenant C. R. Buckle,       ,,

\*             \*             \*             \*

ORDER No. 4307, 27TH NOVEMBER 1860.

Paras: 1 and 2 published in G. O.

2. Paras. 3 and 4 communicated to His Excellency the Commander-in-Chief.

(True Extract.)

(Signed) H. MARSHALL, Colonel.  
*Secretary to Government.*

A. O. 14th December. 1860.—I. With reference to A. O. para. III. of the 8th September 1859, it is to be distinctly understood that the permission therein given to men to dispose of their kit, with the exceptions named, does not include their Bedding; viz. Blanket, Sheet and Quilt.

III. The words "and signed by the Commandant of Artillery" are to be erased from the 1st para. of A. O. No. 3 dated 28th February 1860, as the new form of Discharge Certificate for Europeans, established by G. O. G. No. 327

of the 17th July 1860, does not require the signature of Regimental Commanding Officers;—and it is notified that, on the discharge of a man being sanctioned, from whatever cause, by His Excellency the Commander-in-Chief, this \* At Artillery Head Quarters. form of Certificate, in duplicate, is to be filled\* in and forwarded to the Fort Adjutant of Fort Saint George, there to await the arrival of the man, in order to his acquittance being obtained thereto prior to his embarkation, or discharge in India, as the case may be.

*A. O. 24th December 1860.*—I. The following is published for general information and guidance.

CIRCULAR, No. 2179.

MEMORANDUM.

Government having, in a recent order, animadverted upon the delay which appeared to have unnecessarily occurred in disposing of certain claims to Pension, the Heirs during a long period being unprovided even with temporary Pensions, the Adjutant General of the Army has the honor, by order of the Commander-in-Chief, to request that Committees on claims to Pension may be instructed to explain in their Proceedings, in the column of the Descriptive Roll headed "Remarks," any delay that may occur in investigating claims to Pension, when the claimants may not be provided with temporary Pension Certificates;—explanation should also be given, in the same way, regarding claims not dispatched immediately after the date entered in the Proceedings, or whenever claims may be returned for such correction, as do not necessitate the reassembly of Committees for the purpose.

ADJUTANT GENERAL'S OFFICE, FORT SAINT GEORGE, 21st December 1860.	}	(Signed) W. G. WOODS, Lt.-Col., <i>Adjutant General of the Army.</i>
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*Letter from the Secretary to the Government of India, Military Department, on the conduct of the Madras Golundauze in China, (in continuation of the correspondence at page 451.)* °

MILITARY DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following letter :—

*From the Secretary to the Government of India, Military Department, with the Governor General, on the River Ganges, 4th December 1860, No. 21; to the Secretary to Government Military Department, Fort Saint George.*

I am directed to acknowledge your letter No. 3931, dated 2nd Ultimo, forwarding with correspondence a report of the Officer Commanding the Royal Artillery in China, testifying to the good conduct of the Madras Golundauze in that Country; from the commencement of operations to the capture of the Peiho Forts on the 21st. August last; and to state, for the information of the Honorable the Governor in Council, that its perusal has afforded His Excellency the Governor General very great satisfaction.

ORDER No. 4563, 18TH DECEMBER 1860.

Communicated to the Commander in Chief.

(True Extract)

(Signed) H. MARSHALL, Colonel,  
*Secretary to Government.*

To,

The Adjutant General

(True Copy)

(Signed) H. G. THOMSON, Captain,  
*2nd Asst. Adjut. General of the Army.*



## ARRIVALS.

1860.	Names.	From.	At.
22nd Decr.	2d Captain E. S. Milman,	Europe	Madras.
25th "	Capt. (Lt. Col.) J. L. Barrow, Comy. of Ord. H. S. Force and Actg. Prinl. Comy. of Ordnance.	"	"
26th "	Lieutenant A. R. Gloag,	"	"
" "	" C. H. A. Gower,	"	"
" "	Gent. Cadet Mr. M. R. West,	"	"

## PROMOTIONS AND APPOINTMENTS.

1860.	Names.	To.
4th Decr.	Colonel G. Balfour, C. B. (President of the Mi- litary Finance Commis- sion.)	Appointed 2d Member of the Board of Audit, in the Financial Department.
	Captain E. T. Fasken (Asst to Inspector Genl., and Auditor of Ordnance Accounts) on leave.	Appointed Examiner, Ord- nance Department.
	Captain A. Stewart, Offg. Asst. to Inspector Genl. of Ordnance, and Auditor of Ordnance Accounts.	Appointed Officiating Examiner Ordnance De- partment.
11th Decr.	2d Capt. (Bt. Major) L. Bridge.	Appointed to do duty until further orders with the Artillery Recruit Depôt without prejudice to his appointment in the Horse Artillery.
22nd "	Captain A. V. Falls, C. Compy. 1st Battn. Arty.	Appointed to do duty with the B. Troop Horse Artillery, during the absence in Europe of Captain A. T. Cadell, or until further orders.
" "	2nd Capt. (Major) G. G. Pearse.	Confirmed in his appoint- ment of Commandant 3d Seikh Irregular Cavalry.
31st "	Senior Lieut. W. D'O. Kerrich.	To be 2nd Captain, vice Stewart resigned the Ser- vice; date of Commission, 28th Decem- ber 1860.

1860.

Names.

To.

31st Decr. Senior Capt. (Bt. Maj.) B. W. Black,—To be Lt. Col.  
Senior 2d Captain R. Morton,—To be Captain.  
Senior Lieutenant A. R. Gloag,—To be 2d Captain.

Vice Burgoyne  
retired; date of  
commissions 31st  
December 1860.

*Memorandum.*—Lieutenant C. H. A. Gower, is entitled to the pay and Allowances of his rank from the 28th December 1860, in succession to Kerrich promoted.

Lieutenant Colonel J. E. Mawdsley and Lieutenant P. M. Rolland, are entitled to the Pay and Allowances of their rank from the 31st December 1860, in succession to Burgoyne retired.

“ “ Gent. Cadet Mr. M. R. West.—Admitted upon the Establishment and promoted to the rank of Lieutenant.

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
-1860						
1st Decr.	Capt. B. C. Hitchins... 5th Battalion... 2d Capt. R. C. B. Highmoor... Lt. K. J. L. Mackenzie B. Compy. 2d Batta.	A.	4th	F.	5th	To do duty at Head Qrs. Golundause Battn. until further orders. To join at Cuttack at the expiration of his leave. Till 15th May 1861.
5th "	2d Capt. R. G. F. Hegan... A. Troop Horse Arty.)			Do duty A.	4th	To do duty with the C. Company 3d Battn. Arty. and No. 6 Horse Field Battery as a temporary arrangement without prejudice to his appointment to the Horse Artillery:—to join at Thayetmyoo.
	2d Capt. W. D. Forster... Lieut. F. C. Trevor... D. Compy. 1st Bn. Arty.)	A.	5th	B.	1st	To have effect from the date on which 2d Captain J. Stewart joins his Troop. To do duty with the Arty. at St. Thomas' Mount until the return of his Company to the Coast or until further orders.
19th "	2d Capt. W. D. Forster... B. Compy. 1st Bn. Arty.)					In succession to Burgoyne retired.
31st "	Lt. Colonel G. Briggs... 2d Captain G. G. J. Campbell... 2d Capt. E. S. Milman... D. Troop Horse Brigs.)	B.	4th	F.	H. B.	In succession to 2d Captain J. Stewart, resigned the Service. To do duty with the F. Troop till the arrival of 2d Captain Campbell, or until further orders.

## LEAVE OF ABSENCE IN INDIA.

1860.	<i>Names</i>	<i>Where and Remarks.</i>
14th Decr.	Capt. W. F. B. Laurie Comy. of Ord. Nag. Force.	Bombay, on medical certificate under the old regulations, preparatory to obtaining a final medical certificate to proceed to Europe.
21st "	2nd Capt. C. Elliot, C. B. Depy. Commissioner of Raepora.	Kamptee, with eight weeks' leave, for the purpose of appearing before a Medical Committee, with a view to applying for leave to Europe, on Medical Certificate.

## LEAVE OF ABSENCE IN EUROPE.

1860.	<i>Names.</i>	<i>Remarks.</i>
28th Decr.	Captain A. T. Cadell, B. Troop Horse Artillery.	On medical certificate for 15 months, under the Regulations of 1854, and to embark from Bombay.

## EXAMINED IN THE HINDOOSTANEE LANGUAGE.

1860.  
3rd Decr. Lieutenant M. M. Bowie, — Kamptee, — Qualified for the General Staff under para. 11, G. O. C. C. 6th July 1853, No. 46.

Lieutenant R. Thompson, — Cuttack, Creditable Progress.

The Moonshee allowance to be disbursed to Lieutenants Bowie and Thompson.

## SADDLE CONTRACT FUND.

DISTRIBUTION OF DIVIDENDS OF THE SADDLE CONTRACT FUND FOR 1859.  
*Horse Brigade.*

	Rs.	A.	P.	Rs.	A.	P.
Lieut Col. F. Burgoyne, for the whole year.....	0	0	0	3796	11	4
<i>No. 1, Horse Field Battery.</i>						
Capt. Bt. Major R. Kinhead, from 1st May 1859, to 8th February 1860.....	369	4	3			
Lieutenant E. T. Ouchterlony, from 9th February to 12th March 1860.....	41	9	9			
2d Capt R. C. B. Highmoor, from 13th March to 30th April 1860.....	63	11	5			
				474	9	5

*No. 2, Horse Field Battery.*

	Rs.	A. P.	Rs.	A. P.
2d Captain and Bt. Lt. Col. R. Cadell, for the whole year.....	0	0	0	474 9 5

*No. 3, Horse Field Battery.*

Lieut. M. L. Monckton, from 1st May to 16th May 1859.....	20	12	10	
Lieut. F. C. Trevor, from 17th May 1859, to 13th March 1860.....	391	6	0	
Lieut. M. L. Monckton, from 14th March to 30th April 1860.....	62	6	7	
	<hr/>			474 9 5

*No. 4 Horse Field Battery.*

Lieutenant H. M. Finlay, from 1st May to 31st July 1859.....	119	10	0	
2nd Captain C. Desborough, from 1st August to 21st September 1859.....	67	9	9	
Major G. Selby, from 22nd September 1859 to 30th April 1860.....	287	5	8	
	<hr/>			474 9 5

*No. 5, Horse Field Battery.*

Captain J. D. Scott, from 1st May to 4th August 1859.....	124	13	2	
2nd Captain P. D. Horne, from 5th August to 31st December 1859.....	193	11	10	
Lieutenant F. W. Roberts, from 1st to 24th January 1860.....	31	3	3	
Lieutenant J. Hoyes, from 25th January to 15th February 1860.....	28	9	8	
2nd Captain S. R. Smith, from 16th February to 30th April 1860.....	96	3	6	
	<hr/>			474 9 5

*No. 6, Horse Field Battery.*

2d Captain G. Carleton, from 3rd March to 30th April 1860.....	0	0	0	36 13 10
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*No. 7, Horse Field Battery.*

Captain A. V. Falls, for the whole year.....	0	0	0	474 9 5
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*No. 8, Horse Field Battery.*

	Rs.	A. P.	Rs.	A. P.
2nd Captain G. Carleton, from 1st May, to 23rd September 1859.....	182	7	6	
2nd Captain S. R. Smith, from 18th March to 13th April 1860.....	33	11	11	
2nd Captain R. A. Peach, from 14th to 30th April 1860.....	21	3	11	
	<hr/>			237 7 4

*No. 9, Horse Field Battery.*

Major G. Selby, from 1st May to 31st July 1859.....	119	10	0	
Lieutenant M. H. C. B. Steinman, from 1st to 10th August 1859.....	13	0	0	
Captain J. D. Scott, from 11th August to 21st November 1859.....	133	14	10	
Captain and Bt. Major C. H. Harrison, from 22nd November 1859, to 30th April 1860...	208	0	7	
	<hr/>			474 9 5

*No. 10, Horse Field Battery.*

Captain C. M. J. Thornton, from 1st May to 12th July 1859.....	94	14	8	
Lieutenant K. J. L. Mackenzie, from 13th to 31st July 1859.....	24	11	3	
Captain H. T. Molesworth, from 1st August to 21st December 1859.....	185	14	11	
Lieutenant K. J. L. Mackenzie, from 22nd December 1859, to 31st January 1860.....	53	5	0	
Captain R. G. H. Grant, from 1st February to 25th March 1860.....	68	14	7	
2nd Captain C. Raikes, from 26th March to 30th April 1860.....	46	13	0	
	<hr/>			474 9 5

*No. 11, Horse Field Battery.*

Captain C. T. Collingwood, from 1st May 1859, to 7th March 1860.....	404	6	0	
Lieutenant H. J. Thornton, from 8th March to 30th April 1860.....	70	3	5	
	<hr/>			474 9 5

## No. 12, Horse Field Battery.

	Rs.	A. P.	Rs.	A. P.
Captain G. Carleton, from 24th September to 6th November 1859.....	54	15	10	
Lieut. H. Featherstonhaugh, from 7th Novr. 1859, to 6th February 1860.....	114	15	8	
Lieut. J. Ford, from 7th Feb. to 30th April 1860.	103	11	8	
	<hr/>		273	11 2

*Artillery Recruit Depot.*

Lieut. Colonel W. H. Miller, from 21st Novem- ber 1859 to 25th February 1860.....	121	3	8	
Lieut. D. D. Anderson, from 26th February to 11th April 1860.....	56	3	10	
Captain W. C. F. Gosling, from 12th to 30th April 1860.....	23	11	11	
	<hr/>		201	3 5

## TRANSFER TO INVALID PENSION LIST.

*Extract from G. O. G. No. 516, 14th December 1860.*

“2d Captain C. L. Yeoman, of the Artillery, being per-  
manently disqualified for the performance of both active  
and garrison duties, is transferred to the Invalid Pension  
List.”

Captain C. L. Yeoman was a Cadet of 1848 and arrived in  
India 3rd October 1848.—Date of Commission as 2d Lieute-  
nant 9th June 1848; as 1st Lieutenant 24th May 1854, and  
as 2d Captain 27th August 1858.

Passed examination in Hindoostanee for *Officer of Company*  
14th June 1851.

Served with the 2d Expedition against Burmah from 6th  
April 1852 to 7th January 1853, and was present at the  
Repulse of the attack of the Burmese on Martaban on the  
night of 9th April,—Attack of Burmese camp on 11th  
April.—Repulse of attacks of Burmese on Martaban on 14th  
April.—26th to 31st May,—17th and 18th July,—24th  
July and from 29th July to 1st August 1852.

Served (as Captain) in the Osmanli Horse Artillery in Turkey from 9th July 1855 to 11th August 1856, and was noticed in Artillery Orders, dated 1st May 1857 as follows:—

IV. The Brigadier Commandant of Artillery has the pleasure of publishing to the Regiment, the following testimonial to the abilities and zeal displayed by Lieutenant C. L. Yeoman, while employed with the Osmanli Horse Artillery from 9th July 1855, to 11th August 1856.

“ Lieutenant C. L. Yeoman, Madras Artillery, served under my command, as Captain of Horse Artillery attached to the Osmanli Irregular Cavalry in the East, for upwards of 12 months, during which time he displayed much energy and activity.

“ The Men of the Force were entirely composed of Recruits sent from England, and the Officers were employed as Instructors (in addition to their other duties) which required them to have an intimate knowledge of the drills and exercises of that branch of the service, and I consider Lieutenant Yeoman to have shewn abilities and qualifications, that, I hope may entitle him to the Horse Artillery on his return to India.

WOOLWICH,  
30th December 1856. }

(Signed) E. W. CROFTON, Lt. Col.

*Royal Artillery.*

*Late Col. Comdg. Osmanli Horse Artillery.*

Was 30th, 2nd Captain on the date of Transfer to the Invalid Pension List, viz. 14th December 1860.

#### RESIGNATION.

*Extract from G. O. G. No. 533, 24th December 1860.*

“ 2d Captain James Stewart of the Artillery, is, at his own request, permitted to resign the Service, from the

“ date of departure of the last Mail Steamer for Suez in  
“ the present month.”

Captain J. Stewart was a Cadet of 1850 and arrived in India 27th September 1850.—Date of Commission as 2nd Lieutenant 14th June 1850; as 1st Lieutenant 9th October 1856 and as 2d Captain 1st September 1860.

Passed examination in Hindoostanee for *Officers of Companies* 1st January 1852.

Served with the Saugor Field Division from 24th November 1857 to 28th April 1859.—Was present at the attack at Jheeghun 10th, and Skirmish at Kubrai 17th April 1858.—At the Engagement at Banda 19th April 1858.—Attack on Jhounpore 26th April 1858.—Relief of Kirwee 25th and storming the heights of Punwarree 29th December 1858;—In the meantime, commanded the F. Troop Horse Brigade from 29th August to 22nd November 1858.

Was 39th. 2nd Captain on the date of his Resignation, viz. 27th December 1860.

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#### RETIREMENT.

*Extract from G. O. G. No. 535, 28th December 1860.*

“ Lieutenant Colonel Frederick Burgoyne of the Artillery,  
“ is permitted to retire from the Service on the Pension of a  
“ Colonel, from the 30th December 1860.”

Lieutenant Colonel F. Burgoyne was a Cadet of 1823 and arrived in India 10th March 1825.—Date of Commission as 2d Lieutenant 17th June 1824; as 1st Lieutenant 25th June 1824; as Captain in the Army 17th June 1839; as Captain in the Regiment 31st December 1839; as Major in the Army 11th November 1851; as Major in the Regiment 11th February 1855; as Lieutenant Colonel in the Army 20th July 1858, and as Lieutenant Colonel in the Regiment 27th August 1858.



Served with the Expedition at Rangoon in December 1825.

Passed examination in Hindoostanee as Adjutant, at the College, G. O. C. C. 21st May 1830.

Was Adjutant of 2nd Horse Brigade from 30th March 1827 to 1st February 1831.—Adjutant of the Horse Brigade from 2nd February 1831 to 21st June 1833.—Acting Quarter Master and Interpreter of the Horse Brigade from 1st July to 30th September 1833, and Acting Adjutant E. Troop Horse Brigade in March 1834.

Served in the Field during the Coorg War in 1834.

Was Acting Quarter Master and Interpreter Horse Brigade from 1st February to 4th March 1839.—Adjutant C. Troop Horse Brigade from 5th March to 31st July 1839, and Adjutant F. Troop Horse Brigade from 1st August to 30th November 1839.

Served with the Kurnool Field Force in 1839, and was present at the battle of Doorapore 18th October 1839.

Was Acting Adjutant, Quarter Master and Interpreter Golundauze Battalion from 5th September to 24th October 1840, and Acting Adjutant Golundauze Battalion from 25th October to 8th December 1840.

Served with the Expedition against Nepanee, and was present at the regaining possession of that Fort from a body of Insurgent Arabs on the 20th February 1841, on which occasion he was noticed in a letter from Major Vivian Commanding Field Detachment, to the Deputy Assistant Adjutant General Southern Division of the Bombay Army, published in Madras G. O. C. C. 19th March 1841 as follows:—

“The whole of the Artillery Practice has been most efficient, and I am greatly indebted to that Arm, and to Captains Hall and Burgoyne for the cheerful and zealous manner in which all their duties have been conducted.”

Served with the expedition against Bedamee, and was present at regaining possession of that Fort, in the Belgaum Zillah, from a body of Insurgent Arabs on the 10th June 1841, and was noticed in Madras G. O. C. C. 24th July 1841 by Major General Sir Robert H. Dick, K. C. B. and K. C. H. Commanding the Army in Chief as follows:

\* \* \*

“ the efficiency of  
 “ Captain Burgoyne’s Company of Artillery has been con-  
 “ spicuous on this occasion as it was at Nepaneec,” \* \* \*  
 and in letter from Major Johnson, Commanding Field Detach-  
 ment to the Deputy Assistant Adjutant General Southern  
 Division of the Bombay Army, from which the following  
 are Extracts:—

“ In the afternoon I proceeded with Captain Burgoyne,  
 “ Commanding the Artillery, who at my request officiated as  
 “ Engineer, to made a reconnoissance of the South wall of  
 “ the Pettah,” \* \* \*

“ The Batteries opened about 11 A. M. and continued  
 “ playing until past 2 P. M. when the breach was considered  
 “ practicable; the probability of this having some time pre-  
 “ viously been reported to me, I ordered a storming Party,  
 “ consisting of 50 Europeans of Her Majesty’s 4th Regiment  
 “ and 100 men of the 26th Regiment N. I. the whole under  
 “ the command of Captain Otter, to which such men of the  
 “ Artillery as could be spared, were by Captain Burgoyne;  
 “ in his eager desire to share in every danger, and at the  
 “ earnest request of his Soldiers, \* \* \*  
 “ subsequently added.”

“ To the excellent practice from the Mortar Battery, 20  
 “ shells out of 28 having fallen into a Fort of not more than  
 “ 100 yards diameter, I attribute the early submission of the  
 “ Garrisons of both; \* \* \*

“ To Captain Burgoyne I consider myself under great  
 “ obligations, both for his exertions in his own department.

“ and as an Engineer, the duties of which he at my request  
 “ most cheerfully undertook. . . . .

Was employed in surveying the Forts in the Southern  
 Mahratta Country from 23rd October 1841 to 10th July  
 1842.

Commanded the 1st Battalion Artillery from 21st Decem-  
 ber 1842 to 7th February 1843.—Commanded the E, Troop  
 Horse Brigade from 7th April 1845 to 12th April 1846.—  
 Commanded the C. Troop Horse Brigade from 18th April  
 1846 to February 1855,—the exemplary conduct of which  
 Troop was recorded in G. O. C. C. No. 59, 30th December  
 1847 as follows:—

“ The exemplary conduct of the C. or Captain Burgoyne’s  
 “ Troop of Horse Artillery having been brought to the  
 “ notice of the Most Noble the Commander-in-Chief by the  
 “ reports which have been made on its Annual Inspections  
 “ and Reviews, His Lordship is happy to record in General  
 “ Orders his appreciation of its discipline and efficiency.

“ It is highly honorable to both Officers and Men that no  
 “ one in this Troop has been tried by a Court Martial since  
 “ 1844, and that during the past year there have been but  
 “ three entries in the Defaulter’s Book.

“ These creditable facts are the consequence of good con-  
 “ duct and not obtained by allowing impunity to crime—it is  
 “ perhaps hardly necessary for the Commander-in-Chief to  
 “ add that the degrading vice of drunkenness is scarcely known  
 “ in the Troop, and that with rare exceptions, the Soldiers  
 “ have too much self-respect to abuse the liberal indulgence  
 “ that is granted in the confidence their high character  
 “ inspires.”

Served with the Expedition to Burmah from 8th Sep-  
 tember 1852 to 30th June 1853, the date of cessation of  
 Hostilities.

Commanded Horse Brigade from 18th June to 15th  
 September 1855, and from 15th March 1856 to 30th Decem-

ber 1860, the date of his retirement from the service as 4th Lieutenant Colonel,

**RULES FOR GENERAL INFORMATION AND GUIDANCE FOR THE SETTLEMENT OF CLAIMS OF EUROPEAN SOLDIERS UNDER ORDERS FOR EMBARKATION AND DISCHARGE.**

*G. O. C. C. No. 5, 18th January 1861.*—In order to obviate the inconvenience which is still experienced from the frequent claims advanced, after quitting their Regiments or Stations, by European Soldiers placed under the orders of the Fort Adjutant Fort St. George for embarkation and discharge, the Commander in Chief is pleased to lay down the following rules for general information and guidance on this subject; and to direct that they be most minutely observed in all Corps.

2. Every Man's claims are to be settled before he leaves his Regiment, Battalion or Depôt; and a report made to Army Head Quarters when this has been done. Men for embarkation, if belonging to the Artillery, will then, (under orders from Head Quarters) be collected at the Mount, and Infantry Men at the European Infantry Depôt, and there await an intimation from the Fort Adjutant that passage has been provided for them.

3. Under present Regulations European Soldiers of short Service examined up Country and pronounced unfit for further active Service are required to be finally examined at the Presidency—This course is still to be pursued: but their claims are to be adjusted before they leave their Regiments: and after their examination at the Presidency they will be sent (under orders from Head Quarters) to the Mount or to the European Infantry Depôt, as the case may be, as above ordered.

4. Before a Soldier is permitted to leave his Corps, preparatory to his final removal from it, under any circumstances whatever, whether of unfitness for duty or at his own request, and with or without pension, a Regimental Commit-

tee is to be assembled to investigate his accounts and to record his claims.

5. The Committee will record their Proceedings, in duplicate, according to the subjoined Form. When the Soldier is absent from his Corps or Station, from illness or other cause, the Committee is to be convened at the Station where he may be, all particulars for the completion of its Proceedings, not obtainable on the spot, being ascertained from his Regiment.

6. One Copy of the Proceedings, when completed by the Committee, is for Regimental record; and the other is, in the cases of Men to be embarked for England or elsewhere, or discharged in the Country, to be transmitted to the Fort Adjutant Fort St. George for record in his Office; in all other cases the Second Copy will be forwarded for record to the Adjutant General of the Army.

7. The Proceedings in the cases of Invalids who, on final examination at the Presidency, may be pronounced fit for further service, will be returned to the Regiment for cancellation.

8. In the cases of Men found fit for Garrison duty, and entitled by length of service or otherwise to be sent to the European Veterans, it will also be necessary, as in all other cases, for Committees to record Proceedings.

9. This order is to be considered applicable to Non-Commissioned Staff of Garrisons, Departments, Regiments of Native Infantry and all others who are borne on the list of Effective Supernumeraries.

10. G. O. C. C. No. 50, dated 14th May 1859 is cancelled, its provisions being embodied in this order.

— Regiment of —

Place and date — 18

Proceedings of a Regimental Committee held this day, for the purpose of verifying the accounts and recording the

claims of \_\_\_\_\_ Regimental  
No. \_\_\_\_\_ of the Regiment abovementioned.

PRESIDENT.

MEMBERS.

The Committee having examined and compared the Soldier's book, the Company records and such other Documents as appeared to them to be necessary, report that \_\_\_\_\_  
\_\_\_\_\_ Regimental No. \_\_\_\_\_ being asked to what date he has been paid, answered, that his account is balanced up the latest period required by the regulations: and being further asked whether he has any claim on the Government, for arrears of Pay, Allowances, or Clothing, answered, that he has received all just demands, from his entry into the service up to this date: and in confirmation thereof affixes his signature hereto; having been duly warned by the Committee, before doing so, that any claim that he may hereafter prefer excepting for Pay &c., accruing to him subsequent to the date of these proceedings will in no case be admitted.

I acknowledge this to be true.

\_\_\_\_\_ (Signature of Soldier.)

Witness

\_\_\_\_\_ Commanding the Company to which he belongs.

The Committee have ascertained that \_\_\_\_\_ Soldier's Book is correctly balanced and signed by the Officer Commanding his Company.

\_\_\_\_\_ PRESIDENT.

\_\_\_\_\_ } MEMBERS.  
\_\_\_\_\_  
\_\_\_\_\_ }

The foregoing Report is hereby confirmed by me \_\_\_\_\_  
Commanding \_\_\_\_\_ Regiment of \_\_\_\_\_

**DIRECTIONS FOR BANDS WITH REGIMENTS WHEN FORMED IN LINE &c.**

*G. O. C. C. No. 8, 25th January 1861.*—The Commander in Chief directs the publication of the following General Order by the Commander in Chief in India, dated Adjutant General's Office, Simla, 31st December 1860, the provisions of which are made applicable to the Madras Army.

The Commander in Chief is pleased to publish the following Circular Memo. from the Horse Guards, dated the 20th October last, and to direct that its provisions be made applicable to Her Majesty's Indian Forces.

“ His Royal Highness the General Commanding in Chief is pleased to direct that when a Regiment of Infantry is formed in line, the Band shall be drawn up in two ranks in rear of its centre, and shall march past and retain, whilst the Regiment passes, the same formation, receiving the word of Command “ left turn, right wheel,” when near the saluting point. The Drummers will form a third rank.

“ This does not apply to Bands of a Brigade massed whilst the Brigade marches past.”

**APPLICATIONS FOR PERMISSION TO COUNT AS SERVICE FOR RETIRING PENSION, TO SPECIFY THE PARTICULARS OF THE FIELD SERVICE ON WHICH THE OFFICER WAS ENGAGED.**

*G. O. C. C. No. 10, 28th January 1861.*—Applications for permission to count as service for Retiring Pension under the provisions of G. O. G. No. 290 of 15th September 1857, the period of absence on leave occasioned by wounds or illness contracted by service in the Field, are required to specify the particulars of the Field Service on which the Officer was engaged.

**ATTENTION OF COMMANDING OFFICERS CALLED TO G. O. G. RELATING TO ESTATES OF OFFICERS AND SOLDIERS.**

*G. O. C. C. No. 11, 30th January 1861.*—The attention of Commanding Officers, particularly those Commanding

Stations is called to G. O. G. No. 79, dated 22nd April 1851, relating to the Estates of Officers and Soldiers of H. M.'s

Vide Para. 3, Section III. Indian Forces, the provisions of

which have been neglected in several instances, especially in the cases of Soldiers who have died when absent from their Regiments or Departments.

2. Presidents of Committees of Adjustment cannot be too careful in the preservation of vouchers and all other documents relating to Military Estates; and Commanding Officers should transmit the Proceedings of Committees of Adjustment to the Secretary to Government in the Military Department as required by the above order, without any avoidable delay.

INDENTS FOR SCHOOL BOOKS, FURNITURE, &c. TO BE FORWARDED TO THE SUPERINTENDENT ARMY SCHOOLS.

G. O. C. C. No. 12, 31st January 1861.—The Commander in Chief directs that in future all Indents for School Books, Furniture, &c. required for the use of Army Schools be forwarded to the Superintendent Army Schools Madras Presidency for Check; and by him passed on to the Department of supply.

A. O. 7th January 1861.—II. The following is published for general information and guidance.

No. 25.

To,

*The Brigadier Commandant of Artillery.*

SIR,

\* Requesting to be informed whether men, who have been re-enlisted with the benefit of former Service, can have their previous convictions by Courts Martial adduced against them, in the event of being brought to trial subsequent to re-enlistment.

With reference to your letter\* dated 22nd ultimo No. 1483, I have the honor, by or-

der of the Commander in Chief, to state that, in the case



of men who have re-enlisted within six months, after discharge on completing the first period of Service, with the benefit of former Service, convictions by Courts Martial (under the Indian Mutiny Act) which occurred previous to discharge, may be adduced against them under the provisions of the 16th clause of that Act, in the event of their being brought to trial subsequent to their re-enlistment.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE, } (Signed) W. G. WOODS, Lt. Col.  
 FORT SAINT GEORGE, } *Adjutant General of the Army.*  
 4th January 1861.

*A. O. 8th January 1861.—Memo:—*The Commandant of Artillery directs that when Commanding Officers forward, for submission to Superior Authority, applications from Officers under their command for preferment of any sort, they state their opinion of the merits, qualifications, and services of the Applicants.

*A. O. 10th January 1861.—III.* Under instructions from Army Head Quarters, the Commandant of Artillery directs that, whenever the investigation of a claim of Heir to Pension is unavoidably delayed after the casualty occurs, the claimant be provided with a Temporary Pension Certificate, in conformity with the instructions laid down in paras. 16 and 17 Section VI, page 55, of the Family Payment Regulations.

*A. O. No. 1, 22nd January 1861.—I.* The Commandant of Artillery, under instructions from Army Head Quarters, directs it to be notified that, should Officers undertake to send for Watches or other articles for men of the Regiment, from England or elsewhere, the responsibility of such transactions must fall entirely upon the Officers themselves.

2. Should men die, before they have been actually put in possession of articles so sent for, their Estates are not

chargeable with any loss which may arise in consequence of the transaction.

*A. O. No. 2, 31st January 1861.*—II. The Commandant of Artillery has had before him the Proceedings of a Court of Inquiry assembled at Secunderabad, to investigate the cause of an accident which occurred at the Annual Practice at that station, whereby the hand of a man has become seriously injured.

2. The opinion of the Court, on the evidence before it, is "that the accident may be attributed to some sparks from the muzzle of No. 1 Gun having been blown over by the wind and ignited the priming of No. 2 Gun," to which the injured man was serving as No. 4.

3. The perusal of these Proceedings clearly shews that this accident might have been averted;—the wind is stated to have been blowing from right to left across the Battery, causing the smoke and fire to be carried over Guns which had not been fired, and which would not have occurred had the simple precaution been taken of firing the Guns of the Battery successively towards, instead of *from*, the quarter the wind was blowing.

4. The attention of Officers Commanding Divisions of Artillery is called to this point.

## ARRIVALS.

1861	Names.	From.	At.
12th Jany.	Capt. (Bt. Maj.) G. P. Eaton.	Bangalore	St. Thos' Mount.
26th	Captain H. E. Hicks.	} China.	} Madras.
	2d. Capt. J. McK. Macintyre.		
	Lieut. J. G. Marshall.		
	" W. H. McCausland.		
	" B. Yaldwyn.		
	" W. A. Warren.		
	" C. C. Saxton		
27th	Lt. Colonel E. Brice.	Rangoon.	"
27th	2d Capt. G. G. J. Campbell.	} Europe.	}
	Lieut. A. P. Bainbridge.		

## DEPARTURES.

1861.	Names.	From.	To.
2nd Jany.	Lieut. Col. G. Briggs,	St. Thomas' Mount.	Bangalore.
4th "	2nd Captain E. S. Milman,	"	"
11th "	Captain E. W. Dance,	"	Kamptee.
14th "	2nd Capt. (Bt. Major) L. Bridge,	"	Bangalore.
23th "	Lieut. C. H. A. Gower,	"	Rangoon.

## PROMOTIONS AND APPOINTMENTS.

1861.	Names.	To.
5th Jany.	Lieutenant J. McNeil.—	Appointed Adjutant and Quarter Master of the 1st Battalion Artillery.
11th "	Captain A. Stewart, Commissary of Ordnance.	Appointed to the charge of the Arsenal at Nagpore, vice Captain Laurie, proceeded to Europe under the old regulations.

Do. Do. Will continue to officiate as Assistant to the Inspector General of Ordnance &c., during Captain Fasken's absence, or until further orders.

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861.						
2d Jany.	Capt. (Bt. Major) G. P. Eaton. C. Troop Horse Arty. }				d. d. with the 1st Batn. Artillery as a temporary arrangement without prejudice to his appointment in the Horse Artillery.	To join the Head Quarters at the Mount.
" "	2nd Capt. A. J. Ogilvie } D. Troop Horse Arty. }				d. d. with the C. Co. 1st Batn. Arty. as a temporary arrangement without prejudice to his appointment in the Horse Artillery.	To join.
	2nd Capt. A. R. Glog. } 5th Battalion. }				d. d. Artillery Recruit Depot.	To join.
	Lieut. C. J. McMahon....	B.	H. B.	A.	H. B.	To join.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861. 8th Jany.	A. Company } Colonel 1st Supl. Comy. } dauze.		C. China		St. Thomas' Mount.	The movements notified in G. O. G. No. 496, dated 27th November 1860, are cancelled. Will now accompany the Company to Cannanore.
	† C. Company Gun Lascars attached to C. Company 2d Batn.					
	† G. Company Gun Lascars attached to C. Company 1st Batn.					
9th "	Lieut. Col. W. A. Orr.		H. Be. Non Effective late promotion.		1st Battn.	Europe S. C.
	" B. W. Black				H. Be. Non Effective.	Director Artillery Depot.
	Capt. (Bt Major.) J. Babington D Comy. 4th Bn. Arty.)				do duty Head Qrs. 5th Battalion.	To join at the Mount.
	Capt. A. Stewart.....	A.	1st		H. Be. Non Effective.	Staff duty.
	" W. F. B. Laurie...	D.	5th	B.	4th	" "
	" R. Morton.....		late promotion.	A.	1st	" "
	2d Capt. F. L. Playfair...		do.	D.	4th	" "
	" W. D'O. Kerrieh		do.	E.	5th	Gr. Mr. & Intpr. 5th Battn.
	" A. R. Gloag.....		do.	C.	4th	To do duty at the Artillery Recruit Depot until further orders.
31st "	Lieut. F. E. Hadow.....	A.	1st	B.	2nd	To join.
	2d Capt. (Bt. Major) L. Bridge, Horse Artillery.....					Relieved from doing duty at the Artillery Recruit Depot, and will proceed to join his Troop at Bangalore.
	Capt. H. E. Hicks.....	1st Spl.	5th	B.	4th	
	Lieut. F. E. Hadow.....	B.	2nd	B.	4th	To join.
	" J. F. Pierson...	d d.	4th	B.	2nd	

## LEAVE OF ABSENCE IN INDIA.

1861.	Names.	Where and Remarks.
4th Jany.	Lieut. H. Featherstonhaugh, 3rd Battalion Artillery.	Secunderabad, S. C. from 14th December 1860 to 14th February 1861.
	Lieut. H. F. Pritchard, C. Com. 4th Battn. Arty.)	From 20th October to 11th November 1860, to enable him to join.
10th "	Lt. Col. (Bt. Col.) J. W. Croggan, 3rd Battalion Artillery.	Centre Division,—in con- tinuation until further orders,

## LEAVE OF ABSENCE IN EUROPE.

1861	Names	Remarks.
4th Jany.	2d Capt. C. Elliot, C. B.	On medical certificate for Depy. Commr. 1st Class } Raepore. } fifteen months, under the new furlough Regulations.

1861	<i>Names</i>	<i>Remarks.</i>
	4th Jany. Captain W. F. B. Laurie.	—On medical certificate for 3 years under the old furlough Regulations.
	11th „ Lt. Colonel G. S. Cotter.	—Leave extended for 6 months.

**THE BOOK OF INSTRUCTION FOR MUSKETRY TO BE CONSIDERED AN ORDER ON ALL SUBJECTS CONNECTED WITH MUSKETRY INSTRUCTION**

*G. O. C. C. No. 13, 4th February 1861.*—The Commander in Chief directs the republication of the following General Order by the Commander in Chief in India, dated Adjutant General's Office, Simla, 15th January 1861, the provisions of which are made applicable to the Madras Army.

The following General Order issued to H. M.'s British Forces on the 31st ultimo, is republished for the guidance of Her Majesty's Indian Army.

“The Book of Instruction of Musketry (latest edition) is to be considered an order on all subjects connected with Musketry Instruction, which are not otherwise provided for in separate General Orders.”

**PURE BEES' WAX TO BE USED IN LUBRICATING ENFIELD RIFLE AMMUNITION.**

*G. O. G. No. 49, 15th February 1861.*—In supersession of G. O. G. 23rd June 1857, No. 190, the Governor in Council directs that, in accordance with the practice obtaining at the other Presidencies and in England, pure Bees' Wax, freed from Acid and without any admixture of oil, be used for the future at this Presidency in lubricating Enfield Rifle Ammunition.

**TRANSFER OF EUROPEAN SOLDIERS FROM THE INDIAN FORCES TO BRITISH REGIMENTS.**

*G. O. C. C. No. 15, 18th February 1861.*—The Commander in Chief with the sanction of Government, directs the republication of the following General Order by the Commander in Chief in India, dated 24th January 1861, the provisions of which are made applicable to the Madras Army.

*Adjutant General's Office, Simla, 24th January 1861.*

The Commander in Chief is pleased to announce that Government have sanctioned the transfer of European Soldiers from the Indian Forces to British Regiments, but that under present circumstances further transfers from the latter to the former cannot be authorized.

ISSUE OF RATIONS TO THE WIVES AND FAMILIES OF EUROPEAN SOLDIERS.

*G. O. G. No. 58, 22nd February 1861.*—The following General Order by His Excellency the Commander in Chief in India, is republished:—

*“ Adjutant General's Office, Simla, 27th December 1860.*

The Commander in Chief is pleased to direct the publication of the following letter from the Officiating Secretary to the Government, Military Department, to the Adjutant General of the Army, No. 836, dated 23rd January 1860, for information and guidance:—

‘With reference to previous correspondence on the subject of the issue of Rations to the wives of European Soldiers, I am desired to acquaint you, for the information of the Right Honorable the Commander in Chief, that, in concurrence with the Right Honorable the Governor General, the Honorable the President in Council is pleased to sanction the issue of Rations to the wives, and half rations to the families, of European Soldiers, upon their first arrival in the country, and when quartered at the Recruit Depots previous to their joining their Regiments; except when their husbands are present with them, in which case half rations to the wives, and quarter rations to the families, are considered sufficient so long as they may remain at the Depot.

‘ Whilst proceeding to join their Regiments, either by river or other route, full Rations to the wives and half Rations to the families may be issued to all alike, whether their husbands are with them or not.

‘The grant in either case is without prejudice to the Subsistence Allowance.

‘It has not been customary to supply Cooks and Dhobies for the wives and families of European Soldiers, and it is not considered necessary to do so now, especially as the grant of Rations, without prejudice to the Subsistence Allowance, has been sanctioned.’ ”

**KHAKEE CLOTHING TO BE GRADUALLY ABOLISHED AND WHITE TO BE SUBSTITUTED.**

*G. O. C. C. No. 17, 21st February 1861.*—With the sanction of Government the Commander-in-Chief directs that when the Khakee Clothing now in use requires to be replaced Officers and Men of H. M.’s Indian Forces adopt the white Tunic, agreeably to the sealed pattern that will be transmitted to Officers Commanding Regiments, &c., by the Superintendent and Agent of Army Clothing: in the meantime should Recruits or others, require new Clothing, white will be supplied of the same pattern as that now in use.

2. The Khakee Clothing will be gradually abolished in the European Regiments of Her Majesty’s Indian Forces and for the future the summer Clothing of the European Soldiers shall consist of two suits of white corresponding in pattern and material with that now ordered to be introduced.

3. The summer Clothing now authorized is to be supplied to Recruits on their arrival at Madras by the Superintendent and Agent for Army Clothing. But it is to be understood that one suit only of this Clothing is served out gratis: for the other suit, the Soldier is to pay.

4. White Helmet covers and Pugrees are to be worn with the white Tunic; those in use being worn out.

*G. O. C. C. 26th June 1858, No. 71*  
*G. O. C. C. 24th September 1859, No. 98*

5. The General Orders as per margin are cancelled.

*A. O. No. 3, 5th February 1861.*—I. The Commandant of Artillery having had under his consideration the great expense incurred by Government in sending men from distant stations to the Mount for Discharge, and the duty imposed upon Officers in adjusting their accounts and claims on the service, desires it may be distinctly understood that, in future, after men have left their stations, no application for cancelling Discharge will be received.

2. This order is to be particularly explained by Officers to all under their command, and when men decline renewing their contract for further service, a report is to be made to the Assistant Adjutant General of Artillery that they have been made acquainted with the same.

*A. O. 7th February 1861.*—I. The attention of Commanding Officers is called to A. O. No. 663 dated 23rd Sep-

\* Notifying that Gun Lascars and Drivers transferred from one branch of the Regiment to another, or who have been re-enlisted, are only entitled to Pay as laid down in G. O. G. 12th November 1839, the class in which they are to stand being decided by the date of their re-enlistment or transfer as Gun Lascars or Drivers, just as if they had then entered the service for the first time.

tember 1841,\* with reference to the recent transfers of Drivers to the Gun Lascar establishment under the provisions of para.

5, G. O. C. C. 23rd September 1859, No. 96.

*A. O. 20th February 1861.*—II. A. O. para. I of the 11th November 1858 and A. O. para. I of the 2nd May 1859 are cancelled, and the following substituted as the latter portion of para. 84 of A. O.  $\frac{1}{13}$ , 20th March, amended by A. O. No. IV, 19th September 1855.

“Returns of Horse Field Batteries, for the Assistant Adjutant General of Artillery, will be transmitted to Artillery Head Quarters under the countersignature of Officers Commanding Divisions of Artillery, without reference to the Battalion the Battery may be temporarily attached to.”

111. Companies having Horse Batteries attached to them will “Return” them monthly to Battalion Head Quarters, in



the columns of Form 8 of A. O. No. 32 of 20th September 1855 formerly used for Karkhanas.

## ARRIVALS.

1861	Names.	From.	To.
8th Feby.	2d Captain P. D. Horne,	Bangalore.	St. Thomas Mount.

## DEPARTURES.

1861.	Names.	From.	To.
5th Feby.	2nd Capt. G. G. J. Campbell,	Madras	Bangalore.
10th	„ Lieut. J. F. Pierson,	‘St. Thomas’ Mount.	Waltair.
12th	„ Lt. Colonel E. Brice,	Madras	Bangalore.
24th	„ Lieutenant D. Cowie,	„	Calcutta.
28th	„ 2d Capt. P. D. Horne,	„	Europe.
—	„ Capt. (Bt. Major) T. H. Campbell,	„	Bangalore.

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861						
22d Feby.	B. Co. 1st Battn. Atty...	Moulmein.		Fort St. George.		To complete the Establishment. To have effect from date of embarkation for Europe of 2d Captain P. D. Horne.  To do duty Horse Brigade during absence in Europe of 2d Captain M. C. Lawson.  To do duty Horse Brigade during absence in Europe of Lieutenant G. A. Goldingham.
	D. Co. 1st „ ...	Rangoon.		St Thomas' Mount.		
	A. Co. 2d „ ...	Tongho.		Rangoon.		
	Head Qrs. 3d Bn. Arty...	Rangoon.		Bangalore.		
	B. Co. 3rd Battn. Arty...	Mount.		do.		
	D. Co. 4th „ ...	Rangoon.		Bellary.		
	No. 3 Bty. without horses.	do.		St Thomas' Mount.		
	No. 4 „ „ ...	Tongho.		Bellary.		
	No. 5 „ „ ...	Mount.		Bangalore.		
	A. Co. Gun Lascars...	do.		do.		
	B. Co. „ ...	Rangoon.		St Thomas' Mount.		
	D. Co. „ ...	Tongho.		do.		
	F. Co. „ ...	Moulmein.		do.		
	H. Co. „ ...	Rangoon.		Bellary.		
	Lieut. W. H. Caine.....	D. 8d		D. H. B.	To complete the Establishment. To have effect from date of embarkation for Europe of 2d Captain P. D. Horne.	
	„ H. P. Lane.....	D. 3d		D. H. B.		
	„ I. Ketchen.....	C. 2d		H. B.		
	„ F. C. Trevor...}				To do duty Horse Brigade during absence in Europe of 2d Captain M. C. Lawson.	
	D. Comy. 1st Bn. Arty.}					
	Lieut. E. W. Childers.}				To do duty Horse Brigade during absence in Europe of Lieutenant G. A. Goldingham.	
	D. Comy. 5th Bn. Arty.}					

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861.						
23d Feby.	Capt. G. A. Purvis.....	B.	5th	A.	5th	To join.
	2d Lt. J. Mc.K. Macintyre	A.	5th	B.	3d	
	Lt. J. G. Marshall.....	1st Supl.	5th	C.	1s 1	To join.
	" W. H. McCausland....	A.	5th	d. d. Artillery Recruit Depot.		
	" B. Yaldwyn.....	1st Supl.	5th	B.	5th	
	" H. Featherstonhaugh.	D.	3d	A.	1st	
	" W. Wyndham.....	B.	5th	A.	5th	
	" C. C. Saxton.....	1st Supl.	5th	F.	5th	To join.
	" W. A. Warren.....	A.	5th	D.	2d	To join.
	" C. d. A. Gower.....	D.	4th	A.	2d	To join.
25th "	" F. C. Trevor.....	D.	1st	.....	H. B.	To have effect from the date of embarkation for Europe of 2d Captain M. C. Lawson.

## LEAVE OF ABSENCE IN INDIA.

1861.	Names.	Where and Remarks.
8th Feby.	2d Captain J. Blair, A. Com. 1st Battn. Arty. Adjt. and Qr. Mr. Arty., in the Straits.	} Sea on medical certificate for 3 months from date of departure, under the Regulation of 1854.
8th "	Lieut. Col. E. Brice,	
14th "	Lieut. H. Featherstonhaugh, 3d Battalion Artillery.	} Bangalore and Nilgiris, S. C. from date of departure till 30th June 1861. Eastern Coast and Madras, S. C. from 29th January to 1st June 1861.
23d "	Lt. Col. (Bt. Col.) R. C. Moore, C. B., 4th Battalion Artillery.	
		} Madras, from 1st March to 1st May 1861, preparatory to applying for a furlouge to Europe.

## LEAVE OF ABSENCE IN EUROPE.

1861.	Names.	Remarks.
5th Feby.	Colonel W. M. Gabbett, Lieut. Col. W. A. Orr, C. B. Captain J. D. Scott. Lieut. F. C Taylor.	} Leave extended for 6 months.

1861.	<i>Names.</i>	<i>Remarks.</i>
5th Feby.	2d Captain M. C. Lawson.	—Furlough for two years, under the Regulations of 1854, and to embark from Bombay.
12th „	2d Captain P. D. Horne, } Horse Artillery. }	Furlough for two years, under the Regulations of 1854.
19th „	2d Captain J. R. J. Robertson.	—For one year, ceasing to draw pay from date of embarkation.
26th „	Lieut. C. R. Buckle.	—Leave extended for 6 months.

EXAMINED IN THE HINDOOSTANEE LANGUAGE.

1861.

5th Feby. Lieutenant W. F. Grey.—Madras.—Qualified for the General Staff under para. 11, G. O. C. C. 6th July 1853, No. 46.

2d Capt. M. B. S. Lloyd,—Tonghoo. } Creditable progress.  
Lieutenant F. E. Hadow,—Madras. }

The Moonshee allowance to be disbursed to Captain Lloyd and Lieutenant Hadow.

14th „ Lieut. R. T. Hamond,—Trichinopoly,—Creditable progress.  
„ K. J. L. Mackenzie,—Passed the examination prescribed for Officers of *Companies*.

The Moonshee allowance to be disbursed to Lieutenant Hamond.

ORDERS CONFIRMED.

12th February 1861.

4th January 1861.—By the Officer Commanding Madras Artillery in the Straits, appointing 2d Captain C. Cameron to the charge of the Office of Adjutant and Quarter Master of the Artillery in the Straits, during the absence of 2d Captain J. Blair on medical certificate or until further orders.

31st January 1861.—By the Officer Commanding Mysore Division, appointing 2d Captain E. S. Milman, to act as Quarter Master of the Horse Brigade Artillery, during the absence of Second Captain Horne on leave, or until further orders.

## REVISED ALLOTMENT OF DRILL APPARATUS.

G. O. G. No. 73, 5th March 1861.—His Excellency the

G. O. G. 21th March 1845, No. 11a. G. O. C. C. 29th Sept. 1846, No. 47. Governor in Council directs the following revised allotment of Drill Apparatus for the several Corps of the Army, to be substituted for that published in the Orders noted in the Margin. All surplus articles to be returned into Store.

Subsidiary Orders regarding the Custody and issue of the Drill Apparatus will be issued by the Inspector General of Ordnance.

Corps.	Standard measuring.	Back sticks.	Wooden clubs.	Pace sticks.	Regulating plumpets.	Plummetts.	Traversing rest.	Tripod and sand bag.	Target iron, large size.	Target iron, ordinary size.	Targets, Pistol Carbine.	Old Swords.	Sticks, with leather guards complete.	Posts, Head Cavalry.	Posts, Infantry.	Posts Ring.	Posts with leather heads.	Bars, leaping complete.	Scaling Ladders.	Spare arms for posts.	Spare rings for posts.	
Brigade of Horse Arty...	1	100	12	3	1	6	0	0	0	0	6	250	250	4	4	4	4	6	0	16	16	8
Troop of do. when detached.....	0	0	0	1	1	1	0	0	0	0	1	100	100	1	1	1	1	1	0	4	4	2
Regiment of Dragoons...	1	100	16	8	1	8	0	0	0	0	6	300	300	4	4	4	4	6	0	16	16	8
Do. of Light Cavalry...	1	50	0	6	1	6	0	0	0	0	7	150	150	4	4	4	4	6	0	16	16	8
Battn. of European Arty...	1	100	30	9	1	8	1	0	1	6	0	100	100	0	0	0	0	0	0	0	0	0
Do. of Golundause.....	1	60	0	6	1	6	1	1	1	6	0	50	50	0	0	0	0	0	0	0	0	0
Regiment of European Infantry.....	1	100	30	12	1	16	1	0	1	10	0	100	50	0	0	0	0	0	4	0	0	0
Do. of Native Infantry	1	100	0	12	1	16	1	1	1	10	0	50	50	0	0	0	0	0	4	0	0	0
Sappers and Miners	1	100	0	12	1	16	1	1	1	10	0	50	50	0	0	0	0	0	4	0	0	0
Company of Arty. when detached.....	0	25	10	1	1	2	0	0	0	2	0	50	50	0	0	0	0	0	0	0	0	0
Compy. with Light Field Battery when detached.	1	25	10	1	1	2	0	0	0	2	0	75	75	0	0	0	0	0	0	0	0	0

N. B.—The wooden clubs already in use, to be retained with Native Corps for the use of Recruits.

GRANT OF £50 PER ANNUM TO THE PENSIONS OF OFFICERS RETIRING BEFORE 1st. AUGUST NEXT.

G. O. G. No. 79, 8th March 1861.—The following Extract from a Military Letter from the Right Honorable the Secretary of State for India, is published.

Letter dated 4th February 1861, No. 17.

1. It has appeared to me desirable, under present circumstances, to offer to Officers of Her Majesty's Indian Military

Forces, entitled by length of Service to claim the full pay pension, some inducement to retire from the Service. I have accordingly resolved, in Council, to grant to such Officers as may retire in this Country before the 1st August next, an addition of £50 per annum to the Pensions to which they may be entitled under the regulations of the Service. A notification to this effect has been published in the *London Gazette*.

2. I desire that a similar inducement be made in General Orders at your Presidency, as respects retirements in India, the 1st October 1861 may be fixed as the date limiting the grant of the special allowance.

**LEAVE OF ABSENCE PREPARATORY TO RETIREMENT TO BE GENERAL, AND NOT PRIVILEGE LEAVE.**

*G. O. G. No. 80, 8th March 1861.*—With reference to *G. O. G. No. 53, dated 3rd February 1860*, the Governor in Council directs that, in future, in accordance with the practice in Bengal, leave of absence preparatory to retiring from the service shall always be *general*, and not *privilege* leave.

**NATIVE COMMISSIONED OFFICERS, AND EUROPEAN WARRANT AND NON COMMISSIONED OFFICERS TO BE PENSIONED FROM A FIXED PROSPECTIVE DATE.**

*G. O. G. No. 91, 15th March 1861.*—The present mode of pensioning Native Commissioned Officers, and European Warrant and Non-Commissioned Officers, involving extra expense, His Excellency the Governor in Council directs that persons belonging to these ranks be in future transferred to the Pension Establishment from a fixed prospective date; promotions in their room being made from or subsequent to such date.

2. This prospective date will be fixed with reference to the remoteness of the Station at which the party to be pensioned may be quartered, and in ordinary cases will not exceed one month from the date on which the pension papers are submitted to Government.

APPOINTING CERTAIN OFFICERS TO DO DUTY WITH RECRUITS, AT THE ROYAL ARTILLERY DEPOT AT WOOLWICH.

G. O. C. C. No. 115, 28th March 1861.—The following Extract from a Military Despatch from the Right Honorable the Secretary of State for India, is published :—

*Despatch dated 23rd February 1861. No. 35.*

4. A number of Recruits having been enlisted for the Royal Artillery, for service in India, it has been deemed expedient that a certain proportion of Officers of the Bengal, Madras, and Bombay Artillery should be appointed to do duty with them at the Royal Artillery Depôt at Woolwich, until the next season of embarkation, and that some of these Officers should then proceed with the drafts to India. In accordance with this resolution, the undermentioned Officers have been appointed, and joined the Depôt on the dates specified, viz. :—

Captain C. H. Hutchinson.....28th Jany. 1861.	Lieut. D. J. M'Gregor.....29th Jany. 1861.
2nd Captain N. G. Campbell.....30th do.	Lieut. C. R. Buekle.....31st do.

These Officers will be entitled to count the time passed at Woolwich as service in India, and if they proceed with Recruits, the period occupied by the voyage. The Officers returning with Recruits will be allowed to count the period passed by them on duty at Woolwich, and on the voyage, as part of the qualifying period necessary for them to serve in India before they are again entitled to a furlough to Europe.

A. O., 4th March 1861.—II. The following is published for general information and guidance hereafter.

No. 1173.

To,

*The Brigadier Commandant*

*Madras Artillery.*

SIR,

In reply to your letter No. 148 dated 9th February 1861, I have the honor, by order of the Commander in chief, to

* Published in A. O. No. 8 of 1857 IV. dated 1st August 1857.
--

inform you that the decision of Government No. 2399,\*

dated 21st July 1857, is not applicable to the case of a *Limited* service Soldier, either as regards Bounty or Kit money.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE, } (Signed) W. G. WOODS, Lt. Col.  
 FORT SAINT GEORGE, } *Adjutant General of the Army.*  
 2nd March 1861.

*A. O.*, 6th March 1861—I. White clothing having, by G. O. C. C. No. 17 of 21st February 1861, been sanctioned for summer wear by the Army, the following modifications of M. A. O. No. 13, of 28th November 1860, become necessary.

At page 223, clause "*Bells*," erase "and Khakee."

The last two lines of page 223 to be altogether erased.

At page 224, line 1, substitute "White" for "Khakee"; and erase "and entire."

" " 224, " 3, erase "*Exception to Khakee being entire*."

" " 224, after clause "*Undress*," erase "Khakee entire in season."

" " 224, line 20, erase from "or with Khakee," to end of clause.

" " 224, clause "*At Church*," erase "or Khakee according to season."

" " 224, " "*Stables (Evening)*," after "Frock Coat," add "or White Jacket;" and erase "or Khakee."

" " 224, " "*Evening Ride*," after "Frock Coat" add "or White Jacket;" and erase "or Khakee."

" " 224, " "*Visiting*," erase "not Khakee as a general rule."

" " 224, " "*The Officer on duty*," erase "but not Khakee."

2. Khakee now in wear may be gradually discontinued.

3. The Jacket sanctioned in Memo: No. 1604 of 18th October 1860 will be worn by Officers instead of the Tunic.

4. Scarlet Pugrees to be continued, for wear with Wicker Helmets.

*A. O., No. 4, 11th March 1861.—V.* The following extract from a Military Despatch from the Home Government dated 8th December 1860, No 189, is published; and the Commandant of Artillery directs the particular attention of all Commanding Officers thereto.

“7. Just cause for dissatisfaction is given to Invalids and discharged soldiers on their arrival in this country when, on application at this Office for the amount of their Saving’s Bank accounts, or other money, which should have preceded them, they are informed, as is too often the case, that no advice has been received. As an illustration of this, the men embarked per “Ascendant” arrived in England on the 17th September last, and frequent applications are received from several of them for sums stated to be due, but up to this date (31st October) no advice has been received, except for one man Gunner Henry Rooney. I trust that greater attention will, in future, be paid to this subject.”

*A. O., No. 5, 28th March 1861.—I.* With reference to the 1st clause of Para. 8 of the letter from the Honorable Court of Directors published in G. O. G. No. 103 of 1st June 1852, it is notified, under instructions from Army Head Quarters, that “if the number of married women drawing the allowance has, in the Horse Brigade (or a Battalion,) been once reduced to 12 per cent, widows on remarriage, if originally they came out from Europe with their former husbands, have a preference or priority of claim to the allowance, when it shall become available, over the widows of soldiers married in India. Both classes of claimants however can only be readmitted to the Government allowance, under the above explained reduction to 12 per cent, when there are vacancies for their reception as new claimants.”



## ARRIVALS.

1861	Names.	From.	To.
13th March	Captain E. T. Fasken,	Europe.	Madras.
22nd "	Capt. (Maj.) J. Babington,	Rangoon.	"
23rd "	Lt. Col. (Col.) R. C. Moore, C. B.	Secunderabad.	"
25th "	Captain C. D. Waddell,	Europe.	"

## DEPARTURES.

1860	Names.	From.	To.
27th Decr. 2d	Capt. C. Elliot, C. B.	} Bombay.	Europe.
1861	Depy. Comsr. Raepore District.		
4th March	Lieut. J. G. Marshall,	St. Thos' Mount.	Cannanore
10th "	" C. C. Saxton,	"	Cuttack.
12th "	" W. A. Warren,	"	Kamptee.
12th "	" G. F. E. S. Neill,	"	Cannanore.
19th "	" C. R. E. Wheatley,	"	Trichinopoly.
21st "	2d Captain J. R. J. Robertson,	"	Europe.
23rd "	Captain G. Carleton,	} "	Bangalore.
23rd "	2d Capt. J. McK. Macintyre,		
23rd "	Lieut. G. Haggard,		
23rd "	" J. Hoyes,		
23rd "	" J. G. Pollock,		
23rd "	" R. Alexander,		
30th "	" W. H. McCausland,	"	"

## PROMOTIONS AND APPOINTMENTS.

1861.	Names.	To.
12th March	Col. G. Balfour, C. B.	Appointed a Member of a special commission to consider and report on the arrangements necessary for carrying out the Amalgamation of the Indian Army with Her Majesty's British Forces.
13th "	2d Captain E. S. Milman.	Appointed Quarter Master and Interpreter of the Horsé Brigade.
18th "	Lieut. W. F. Grey,	G. O. C. C. dated 5th May 1860 directing him to act as Aide-de-Camp to Major General, <i>The Honorable A. A. Spencer, C. B.</i> Commanding Mysore Division "without prejudice to his Regimental duties" is cancelled from this date.

1861.

Names.

To.

18th March Lieut. W. F. Grey.—Appointed to act as Aide-de-Camp to the Officer Commanding Mysore Division.

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861						
4th March	Lieut. Col. J. Maitland.....		3rd		H. Be. Non-Effective.	
	E. Brice..... doing "duty 3rd Batin.)	Horse Brig.			3rd	
	Captain (Brevet Major) J. Babington.....)	D.	4th	D.	5th	To continue to do duty with Head Quarters 5th Battalion at the Mount.
	Captain (Brevet Major) G. Selby.....)	A.	2nd	D.	1st	To continue to do duty with A. Company 2nd Battalion till further orders.
	Capt. C. H. Hutchinson...	D.	1st	A.	2nd	To join.
	" J. H. Elwyn.....	E.	5th	D.	4th	
	" W. F. B. Laurie...	D.	4th	E.	5th	
	2d Capt. A. H. Dawson...	F.	5th	E.	5th	
	" F. St. G. Græme...	F.	5th	D.	5th	
	" W. D. Forster....	B.	1st	D.	1st	To continue to do duty at the Mount until the arrival of his Company.
	" F. L. Playfair....	D.	4th	C.	4th	
	" A. R. Glog.....	C.	4th	D.	4th	To continue to do duty at the Mount until the return of his Company to the Coast.
	Lieut. F. C. Trevor....	Horse Brig. Unposted		B. H. Brig.		To join.
	" C. W. Brereton....	A.	5th	E.	5th	To join at Penang and relieve Captain Elwyn.
	" R. Alexander....	d. d. Recruit Depot.		A.	3rd	To do duty with B. Company 3rd Battalion until its arrival at Bangalore.
	" P. Sanderson.....	do.	do.	D.	1st	To continue to do duty until his Company returns to the Coast.
	" G. F. E. S. Neill...	do.	do.	C.	1st	To join.
	" C. R. E. Wheatly...	do.	do.	C.	2nd	
22d "	Lt. W. H. McCausland } 5th Batin. Artillery.)			To do duty with Horse Brigade.		During the absence of Lieutenant Grey, as Acting Aide-de-Camp to the Officer Commanding the Mysore Division.
	Lieutenant M. H. C. B. Steinman } 2nd Battalion Artillery.)			do.		During the absence in Europe of Lieutenant J. C. Taylor.
	Lieut. R. T. Hamond } 2nd Battalion Artillery.)			do.		During the absence of 2nd Captain R. G. F. Henegan doing duty with the C. Company 3rd Battalion Artillery.
	Lieut. H. G. Pritchard } 3rd Battalion Artillery.)			do.		During the absence of 2nd Captain A. J. Ogilvie doing duty with the C. Company 1st Battalion Artillery.
28th "	Lieut. W. Bryden.....	B.	4th	d. d. C.	2nd	To join at Trichinopoly.

## LEAVE OF ABSENCE IN INDIA.

1861	Names	Where and Remarks
5th March	Lt. Col. G. W. Y. Simpson Actg. Inspector General of Ordnance and Magazines.	} Calcutta on duty.
5th "	Lieut. D. Cowie.—Calcutta on private affairs for 60 days, from date of embarkation, under the regulations of 1854.	
12th "	Captain R. Merton.—Nilgiris, S. C. from 1st March 1861, till 1st March 1862.	
13th "	Lt. Col. E. Brice.—Leave on medical certificate granted in G. O. C. C. 8th February 1861, cancelled from the date on which he may join the detachment of his Battalion at Bangalore, with which detachment he will do duty until the arrival at Bangalore of the Head Quarters of his Battalion now under orders from Rangoon.	

## LEAVE OF ABSENCE IN EUROPE.

1861	Names.	Remarks.
28th March	Lt. Col. (Et. Col.) R. C. Moore, C. B.	—On furlough for one year, under the Old Regulations.

## SERVICES.

G. O. G. No. 94, 15th March 1861.—The following General Order by His Excellency the Governor General of India in Council, is republished.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.

*Fort Welles, the 1st March 1861.*

No. 167, of 1861.—His Excellency the Governor General in Council is pleased to direct the publication of the following paragraphs of a Military Letter from the Right Honorable the Secretary of State for India, No. 50, of the 24th January 1861.

2. His Royal Highness has also expressed his intention of recommending to the Secretary of State for War that a step of Rank be conferred

red or the undermentioned Officers whose names are included in a  
 Recommendatory List received from Lieutenant General Sir Hope Grant,  
 G. C. B. viz.

\* \* \* \*

Captain H. E. Hicks, *Madras Artillery.*

*List of Officers of Her Majesty's Indian Forces, recommended to favorable  
 notice by Lieutenant-General Sir J. Hope Grant, K. C. B., for their  
 Services in China,*

<i>Names.</i>	<i>Services.</i>
* * *	* * *
Captain Hicks.....	Commanded a Rocket and Mountain Battery and rendered very efficient and good service.
* * *	* * *

#### RETIREMENT.

*Extract from G. O. G. No. 115, dated 28th March 1861*

The undermentioned Officers having been permitted to  
 retire from the Service from the dates specified, viz :—

\* \* \* \*

“ Lieutenant Colonel J. E. Mawdsley, Artillery, from the  
 “ 15th January 1861.”

\* \* \* \*

Lieutenant Colonel J. E. Mawdsley was a Cadet of 1826,  
 and arrived in India 12th June 1827.—Date of Commission  
 as 2d Lieutenant 15th December 1826; as 1st Lieutenant  
 12th October 1831; as Captain in the Army 15th December  
 1841; as Captain in the Regiment 3rd July 1845; as Major  
 in the Army 20th June 1854, and as Lieutenant Colonel in  
 the Regiment 31st December 1859.

Was acting Adjutant 1st Battalion Artillery from 28th  
 July to 12th August 1830.—Acting Commissary of Ordnance  
 Bangalore from 17th September to 18th-October 1833.

Was employed with the expedition in Coorg from 17th March to 25th April 1834; and was present at the Ford of the River Cauvery (Hibbaly) into Coorg 2d April 1834;—Attack on the Pagoda of Ramasawmy Curnavey and affair of Aurungay 3rd April 1834.

Was Acting Adjutant B. Troop Horse Brigade from 16th May to 15th July 1837, and from 15th to 30th September 1837.

Was present at the affair on the Fort of Balloorgee His Highness the Nizam's dominions 22d September 1841.

Was Acting Adjutant A. Troop H. B. from 23rd May to 1st October 1842, and from 8th April to 20th June 1843.—In charge of Arsenal Sholapore from 23rd May to 30th September 1842 and from 8th April to 20th June 1843,—Post-Master at Sholapore from 13th October 1841 to 12th August 1845.

Served with the Kolapore Field Force and Commanded Right half A. Troop from 5th October 1844 to 16th May 1845, and was on the march to Buddurghur 7th November 1844 and Purnallaghur and Powenghur 1st December 1844.

Commanded Artillery Kolapore Field Force from 8th February to 16th May 1845,—Commanded D. Company 2nd Battalion Artillery and No. 1 Horse Field Battery from 23rd January to 23rd June 1849.

Commanded D. Troop Horse Brigade from 19th June 1849 to 9th January 1860;—in the mean time served with the Seetabuldee combined Field Force during the Mutiny in June 1857, and with the Kamptee Flying Column from 9th November to 11th December 1858, and commanded Artillery N. S. Force from 16th December 1850 to 15th July 1851.

Lieutenant Colonel J. E. Mawdsley's Services were noticed by the following Officers;—viz :—

By Officer Commanding Artillery Coorg Field Force 24th April 1834.

By Colonel Lloyd, C. B. Commanding Artillery Brigade  
Kolapore Field Force 2nd December 1844.

By Major General Delamotte, C. B. Commanding Kola-  
pore Field Force 28th December 1844.

Returned to Europe on Sick Certificate 12th April 1860,  
where he retired from the Service on the 15th January 1861,  
being then the 11th Lieutenant Colonel.

### SADDLE CONTRACT FUND,

DISTRIBUTION OF THE SADDLE CONTRACT FUND FROM 1ST MAY TO 30TH  
APRIL 1860.

#### *Horse Brigade.*

	Rs.	A.	P.	Rs.	A.	P.
Lieut. Col. F. Burgoyne, for the whole year...	4768	8	3			
Deduct advance...	3796	11	4			
	<hr/>			971	12	11

#### *No. 1; Horse Field Battery.*

Capt. and Bt. Major R. Kinhead, from 1st May 1859, to 8th February 1860, 284 days.....	462	8	3			
Deduct advance...	369	4	3			
	<hr/>			93	4	0
Lieut. E. T. Ouchterlony, from 9th February to 12th March 1860, 83 days.....	53	11	10			
Deduct advance...	41	9	9			
	<hr/>			12	2	1
2d Capt. R. C. B. Highmoor, from 13th March to 30th April 1860, 49 days.....	79	12	9			
Deduct advance...	63	11	5			
	<hr/>			16	1	4

#### *No. 2, Horse Field Battery.*

2d Capt. and Brevet Lieut. Col. R. Cadell, for the whole year.....	596	1	0			
Deduct advance...	474	9	5			
	<hr/>			121	7	7

#### *No. 3, Horse Field Battery.*

Lieut. M. L. Monckton, from 1st to 16th May 1859, and from 14th March to 30th April 1860, 64 days.....	104	3	8.			
Deduct advance...	83	3	5			
	<hr/>			21	0	3

	Rs.	A.	P.	Rs.	A.	P.
Lieut. F. C. Trevor, from 17th May 1859, to 13th March 1860, 302 days.....	491	13	4			
Deduct advance...	391	6	0			
	<hr/>			100	7	4

*No. 4, Horse Field Battery.*

Lieut. H. M. Finlay, from 1st May to 31st July 1859, 92 days.....	149	13	3			
Deduct advance...	119	10	0			
	<hr/>			30	3	3
2d Capt. C. Desborough, from 1st August to 21st September 1859, 52 days.....	84	10	11			
Deduct advance...	67	9	9			
	<hr/>			17	1	2
Major G. Selby, from 22d September 1859 to 30th April 1860, 222 days.....	361	8	9			
Deduct advance...	287	5	8			
	<hr/>			74	3	1

*No. 5, Horse Field Battery.*

Capt. J. D. Scott, from 1st May to 4th August 1859, 96 days.....	156	5	6			
Deduct advance...	124	13	2			
	<hr/>			31	8	4
2d Capt. P. D. Horne, from 5th August to 31st December 1859, 149 days.....	242	10	6			
Deduct advance...	193	11	10			
	<hr/>			48	14	8
Lieut. T. W. Roberts, from 1st to 24th January 1860, 24 days.....	39	1	4			
Deduct advance...	31	3	3			
	<hr/>			7	14	1
Lieut. J. Hoyes, from 25th January to 15th February 1860, 22 days.....	35	13	3			
Deduct advance...	28	9	8			
	<hr/>			7	3	7
2d Capt. S. R. Smith, from 16th February to 30th April 1860, 75 days.....	122	2	3			
Deduct advance...	96	3	6			
	<hr/>			25	14	9

Rs. A. P. Rs. A. P.

*No. 6, Horse Field Battery.*

2d Capt. G. Carleton, from 3rd March to 30th April 1860, 59 days.....	96	1	4		
Deduct advance...	36	13	10		
				59	3 6

*No. 7, Horse Field Battery.*

Capt. A. V. Falls, for the whole year.....	596	1	0		
Deduct advance...	474	9	5		
				121	7 7

*No. 8, Horse Field Battery.*

Capt. G. Carleton, from 1st May to 23rd September 1859, 146 days.....	237	12	4		
Deduct advance...	182	7	6		
				55	4 10
2d Capt. S. R. Smith, from 18th March to 13th April 1860, 27 days.....	43	15	6		
Deduct advance...	33	11	11		
				10	3 7
2d Capt. R. A. Peach, from 14th to 30th April 1860, 17 days.....	27	10	11		
Deduct advance...	21	3	11		
				6	7 0

*No. 9, Horse Field Battery.*

Major G. Selby, from 1st May to 31st July 1859, 92 days.....	149	13	3		
Deduct advance...	9	10	0		
				30	3 3
Lieut. M. H. C. B. Steinman, from 1st to 10th August 1859, 10 days.....	16	4	6		
Deduct advance...	13	0	0		
				3	4 6
Capt. J. D. Scott, from 11th August to 21st November 1859, 103 days.....	167	11	10		
Deduct advance...	133	14	10		
				33	13 0
Capt. and Brevet Major C. H. Harrison, from 22nd November 1859, to 30th April 1860, 161 days.....	262	3	2		
Deduct advance...	208	0	7		
				54	2 7



Rs. A. P. Rs. A. P.

*No. 10, Horse Field Battery.*

Capt. C. M. J. Thornton, from 1st May to 12th July 1859, 73 days.....	118 14 2	
Deduct advance...	94 14 8	
	<hr/>	23 15 6
Lieut. K. J. L. Mackenzie, from 13th to 31st July and from 22nd December 1859, to 31st January 1860, 60 days.....	97 11 5	
Deduct advance...	78 0 3	
	<hr/>	19 11 2
Capt. H. T. Molesworth, from 1st August to 21st December 1859, 143 days.....	232 14 2	
Deduct advance...	185 14 11	
	<hr/>	46 15 3
Capt. R. G. H. Grant, from 1st February to 25th March 1860, 54 days.....	87 15 1	
Deduct advance...	68 14 7	
	<hr/>	19 0 6
2d Capt. C. Raikes, from 26th March to 30th April 1860, 36 days.....	58 10 0	
Deduct advance...	46 13 0	
	<hr/>	11 13 0

*No. 11, Horse Field Battery.*

Capt. C. T. Collingwood, from 1st May 1859, to 7th March 1860, 312 days.....	508 1 11	
Deduct advance...	404 6 0	
	<hr/>	103 11 11
Lieut. H. J. Thornton, from 8th March to 30th April 1860, 54 days.....	87 15 1	
Deduct advance...	70 3 5	
	<hr/>	17 11 8

*No. 12, Horse Field Battery.*

Capt. G. Carleton, from 24th September to 6th November 1859, 44 days.....	71 10 6	
Deduct advance...	54 15 10	
	<hr/>	16 10 8
Lieut. H. Featherstonhaugh, from 7th Novem- ber 1859, to 6th February 1860, 92 days...	149 13 3	
Deduct advance...	114 15 8	
	<hr/>	34 13 7

	Rs.	A.	P.	Rs.	A.	P.
Lieut. J. Ford, from 7th February to 30th April 1860, 84 days.....	136	12	9			
Deduct advance....	103	11	8			
	<hr/>			33	1	1

*Artillery Recruit Depot.*

Lieut. Col. W. H. Miller, from 21st November 1859, to 25th February 1860, 97 days.	157	15	6			
Deduct advance....	121	3	8			
	<hr/>			36	11	10
Lieut. D. D. Anderson, from 26th February to 11th April 1860, 46 days.....	74	14	7			
Deduct advance....	56	3	10			
	<hr/>			18	10	9
Capt. W. C. F. Gosing, from 12th to 30th April 1860, 19 days.....	30	15	1			
Deduct advance....	23	11	11			
	<hr/>			7	3	2

CONTINGENT GUN ALLOWANCE.

G. O. G. No. 111, 26th March 1861.—His Excellency the Governor in Council is pleased to direct that the following revised Statement exhibiting the names of Officers and the periods they served in the Bengal and Saugor Territories during which they are specially entitled under the Orders of the Supreme Government to share in the Contingent Gun Allowance under the rules of the Bengal Presidency, be published in General Orders—in Substitution of that published in G. O. G. 27th November 1860, No. 491, which has since been discovered to be incorrect:—

*Distribution Details.*

A. Troop Madras Horse Artillery.	}	Each Troop or Company being entitled to Share, according to the period of their service.
3 E. do. do.		
F. do. do.		
A. Company 3rd Battalion Artillery.		
D. do. do.		
A. do. 4th do.		
B. do. do.		
C. do. 5th do.		

Computation amount of Contigent Gun Allowance...Rs. 20,873 11 2

Deduct Cost of Materials and  
Workmen employed in the repair of  
Ordnance and Carriages as per  
Statement from the Inspector Ge-  
neral of Ordnance and Magazines...Rupees 3,872 9 8

Amount of Bills already passed  
by the above Functionary on the  
above account ... .. Rupees 135 6 6

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4,008 0 2

Balance to be distributed Rupees 16,865 11 0

Rs. A. P. Rs. A. P.

*A. Troop Madras Horse Artillery.*

Captain (Lieut. Colonel) J. D. Mein, from  
11th March to 23rd November 1858, and  
from 10th January to 31st March 1859,  
339 days ... .. 1,074 0 0

2nd Captain R. G. F. Henegan, from 24th  
November 1858, to 9th January 1859, and  
from 1st April 1859, to 25th February  
1860, 378 days ... .. 1,197 9 0

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2,271 9 0

*½ E. Troop Madras Horse Artillery.*

2nd Captain (Brevet Major) L. Bridge, from  
25th August 1857, to 4th April 1859,  
1 year and 223 days ... .. 931 7 0

Lieutenant J. C. Taylor, from 5th April to  
3rd October 1859, 182 days ... .. 288 4 10

Lieutenant H. G. Pritchard, from 4th October  
1859, to 14th January 1860, 109 days... 163 2 6

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1,382 14 4

*F. Troop Madras Horse Artillery.*

Lieutenant Colonel E. Brice, from 12th  
February to 7th May 1858, 85 days..... 269 4 8

Captain G. E. B. Holmes, from 8th May to  
27th August 1858, 113 days ... .. 354 13 4

Lieutenant J. Stewart, from 28th August to  
8th October 1858, 42 days ... .. 133 1 0

	Rs.	A.	P.	Rs.	A.	P.
2nd Captain R. G. F. Henegan, from 9th October to 21st November 1858, 44 days.	139	6	4			
Captain W. C. F. Gosling, from 22nd Novem- ber 1858, to 2nd January 1860, 1 year and 42 days ... ..	1,289	7	0			
Lieutenant G. A. Goldingham, from 3rd to 16th January 1860, 14 days ... ..	44	5	8			
Captain H. T. Molesworth, from 17th January to 18th February 1860, 33 days ... ..	104	8	9			
	<hr/>			2,334	14	9

*A. Company 3rd Battalion Artillery.*

Captain (Lieutenant Colonel) G. S. Cotter, from 12th June to 26th October 1857, and from 11th January to 26th February, and from 20th March to 31st May 1858, 257 days ... ..	814	3	5			
2nd Captain G. G. Campbell, from 27th October 1857, to 10th January and from 27th February to 19th March, and from 1st to 25th June 1858, 122 days ... ..	386	8	2			
2nd Captain W. J. Bradford, from 26th June to 27th August 1858, 63 days ... ..	199	9	6			
Captain (Lieutenant Colonel) R. Cadell, from 28th August 1858, to 11th February 1860, 1 year and 168 days ... ..	1,688	10	0			
	<hr/>			3,088	15	1

*D. Company 3rd Battalion Artillery.*

Captain A. C. Jones, from 16th November 1857, to 19th October 1858, 338 days ...	1,070	13	4			
Captain C. H. Hutchinson, from 20th October to 19th November 1858, 31 days... ..	98	3	4			
Lieutenant R. A. Baker, from 20th Novem- ber 1858, to 18th February 1859, 91 days	288	4	10			
Lieutenant H. P. Lane, from 19th February to 1st May 1859, 72 days ... ..	228	1	8			
	<hr/>			1,685	7	2

Rs. A. P. Rs. A. P.

*A. Company 4th Battalion Artillery.*

Captain R. Kinkead, from 19th January to 21st March 1858, and from 29th January 1859, to 9th February 1860, 1 year and 74 days ... ..	1,390	13	1
Lieutenant R. Pope, from 22nd March to 15th June 1858, 86 days ... ..	272	7	4
Captain C. H. Harrison, from 16th June to 23rd November 1858, 161 days ... ..	510	1	1
Lieutenant C. Johnson, from 24th November 1858, to 28th January 1859, 66 days ... ..	209	1	6
Lieutenant E. T. Ouchterlony, from 10th to 25th February 1860, 16 days ... ..	50	11	0
	<hr/>	2,433	2 0

*B. Company 4th Battalion Artillery.*

Captain H. E. Hicks, from 21st March to 28th June 1859, 100 days... ..	316	13	0
Lieutenant F. H. Thomson, from 29th June to 20th August 1859, 53 days ... ..	167	14	7
Lieutenant A. M. Rawlins, from 21st August 1859, to 9th January 1860, 142 days ... ..	449	14	0
Lieutenant W. Bryden, from 10th to 12th January 1860, 3 days ... ..	9	8	9
	<hr/>	944	1 7

*C. Company 5th Battalion Artillery.*

Captain S. Rippon, from 17th August to 23rd October 1857, 68 days ... ..	215	6	11
Captain (Lieutenant Colonel) R. Cadell, from 24th October, to 22nd December 1857, and from 4th January to 20th August 1858, 289 days ... ..	915	9	6
2nd Captain C. Desborough, from 23rd December 1857, to 3rd January and from 21st August 1858, to 7th June 1859, 303 days ... ..	959	15	2

	Rs.	A.	P.	Rs.	A.	P.
Lieutenant H. P. T. McCarthy, from 8th June to 7th July, and from 7th October to 24th December 1859, 109 days ... ..	345	5	3			
2nd Captain J. R. J. Robertson, from 8th July to 6th October 1859, 91 days ... ..	288	4	10			
	<hr/>			2,724	9	8
				16,865	9	7
Lost by Fractions...				0	1	5
	<hr/>			Total Rupees...	16,865	11 0
	<hr/>					

Rs. A. P.

The undermentioned Officers having already drawn the Contingent Gun Allowance set opposite their names, a corresponding amount should be recovered from their respective Shares, and credited to Government.

2nd Captain (Brevet Major) L. Bridge, $\frac{1}{2}$ E. Troop Madras Horse Artillery ... ..	171	4	7
Captain (Lieutenant Colonel) R. Cadell, A. Company 3rd Battalion Artillery ... ..	480	0	0
2nd Captain C. Desborough, C. Company 5th Battalion Artillery ... ..	232	4	1
Lieutenant H. P. T. McCarthy, C. Company 5th Battalion Artillery ... ..	120	0	0
2nd Captain J. R. J. Robertson, C. Company 5th Battalion Artillery ... ..	160	0	0

N. R.—Such of the Officers as may have been overpaid according to the Statement in G. O. G. 27th November last, No. 491, are required to refund the excess.

His Excellency the Governor in Council is pleased to direct that the Balances due on account of Contingent Gun Allowance be discharged accordingly by Paymasters under the orders of the Military Auditor General.

**SUPPLY OF HAVERSACKS AND SODA WATER BOTTLES TO BE MADE BY THE COMMISSARIAT DEPARTMENT ON INDENT.**

G. O. G. No. 121, 3rd. April 1861.—His Excellency the Governor in Council is pleased to direct, with reference to G. O. G. No. 202, dated 1st June 1858, that the supply of

Haversacks and Soda Water bottles to European Soldiers, shall be made by the Commissariat Department on Indents from the Officers concerned, and that when no longer required, they shall be returned into Store through the Commissariat Department, the men being held answerable for any deficiency caused by neglect.

**STRENGTH AND COMPOSITION OF MOVEABLE COLUMNS IN THE THREE PRESIDENCIES.**

*G. O. G. No. 122, 3rd. April 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished.

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William, the 19th March 1861.*

**No. 247 of 1861.—RESOLUTION.**—In the letters noted in the margin, the Military Finance Commission submitted to

Military Finance Commission,  
No. 2153, dated 10th August 1860.  
Ditto No. 2469, dated 14th September 1860, paras. 30-35.

Government several arrangements respecting the organization of the moveable Column.

In paragraphs 18 to 23 of the letter from the Military Department, to the Adjutant General of the Army, No. 782, of the 18th October 1860, annexed to this Resolution, Government expressed its concurrence generally in the views of the Commission, and in paragraphs, 20 and 21 enjoined arrangements by which the greater efficiency of the moveable Columns was insured.

It is now resolved to carry into effect the several arrangements proposed, and it is accordingly directed that the strength and composition of the Columns in the three Presidencies shall, for the present, be organized as follows:—

**BENGAL.**

9 Batteries of Artillery Field Pieces..	54		
9 Battalions of European Infantry..	7,650	Non-Commissioned Rank and File	
6 Squadrons of European Cavalry..	840	ditto	ditto.
12 Battalions Native Infantry.....	8,400	ditto	ditto.
6 Squadrons Native Cavalry.....	780	ditto	ditto.

with seven days' supplies of all kinds for Europeans, and two days rations, &c., for Native Ranks as well as Horses; together with Spare ammunition at sixty rounds per man for Infantry, and twenty rounds for Cavalry; sick carriage, &c., being provided at 5 per cent. of the above strength.

#### MADRAS AND BOMBAY,

The total strength of the moveable Columns at both these Presidencies is not, together, to exceed one-third of the strength fixed for the Bengal Presidency; but with such modifications in the strength of the different Arms composing the Columns, as from local circumstances may appear necessary, supplies, ammunition, and sick carriage being in the same proportion as ordered for Bengal.

The Commander-in-Chief in India, and the Commanders-in-Chief of the Madras and Bombay Armies will, under the approval of the Government of India, and the Governments of Madras and Bombay, fix upon the Stations at which these Columns shall be kept up in the Presidencies of Bengal, Madras, and Bombay; and will likewise define the strength and composition of each Column, and the arrangements necessary, in conformity with the views of the Government of India, for keeping them in a state of efficiency and in readiness for immediate movement. The Commissary General will, in pursuance of this Resolution, take immediate measures to reduce the Establishments now maintained for moveable Columns to the scale necessary for the strength above stated, and distribute them to the Stations that His Excellency the Commander-in-Chief may fix on, as those which, from the paucity of ordinary carriage or other circumstances, most require such provision

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Government, Fort St. George.      ORDERED, that a copy of the  
 Ditto.      Bombay.  
 Qur, Master Genl. of the Army.      above Resolution be transmitted  
 Commissary General.  
 Inspector General of Ordnance.      to the Governments and Authori-  
 ties named in the margin, for information, with a request



that the reductions may be promptly carried out, and the expenditure to be incurred for the moveable Columns under this arrangement as well as the Stations to which they are distributed, early reported; the Civil, Political, and Military conditions on which the several Columns are formed being also stated.

The Military Finance Department will issue to the Departments under its control such subsidiary orders respecting the Financial arrangements involved in the above Resolution as may be necessary, and will suggest any for which the authority of the Government of India may be required.

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*Extract from a letter from the Secretary to the Government of India, Military Department, to the Adjutant General of the Army, No. 782, dated 18th October 1860.*

18. The letter No. 2153 of the 10th of August last, on the subject of moveable Columns, alluded to in paragraph 30, was communicated to you with my letter No. 714, of the 20th August 1860. To some extent the views of the Commander-in-Chief on the moveable Columns have been conveyed in your letter No. 1446A., of the 8th September last.

19. The Commission proceed, in paragraphs 30 to 35 inclusive, to enter particularly into the subject of moveable Columns, and the total strength at which they might be maintained in the three Presidencies. The Governor General begs to know whether the Commander-in-Chief has any objection to offer to the scheme of the Commission in regard to moveable Columns in Bengal in particular, and also in regard to those in Madras and Bombay. The Governments of those Presidencies have already been addressed on this subject, and their attention to the practicability of reducing the moveable Columns to the extent proposed by the Military Finance Commission will further be specially desired.

20. In connection with this fact of the subject, I am directed to state, for the information of the Commander-in-

Chief, that it has been suggested by the Commission that, in order to enable Commanding Officers and others to become personally acquainted with the actual requirements of moveable Columns, with the arrangements for their equipments, their carriage, and the necessary supplies of all descriptions, and to ensure the active and intelligent co-operation of all the parties concerned, whether belonging to Regiments of which the Columns are composed, or to Departments employed in their equipment and march, a practice may be forthwith established of ordering out each moveable Column occasionally for the purpose of exercise, that in times of tranquillity they may become so accustomed to move, that, when required to turn out under the sudden call of duty, to quell any disturbance, every one may know his place and clearly comprehend what he has to do, and that confusion and disorder may thereby be avoided.

21. The Governor General in Council considers this to be a most useful suggestion, and one well calculated to ensure the efficiency of the moveable Columns.

22. His Excellency in Council will be prepared to Sanction the expense which must attend the exercise of the moveable Columns and other incidental outlay; satisfied that the money so disbursed will far more than repay its value by the greatly increased efficiency of the available Force and perfect readiness at all points for immediate calls of service, which will thus be acquired by the Officers and Men and the whole of the Establishments attached to moveable Columns.

23. Under this system the Cattle Establishment attached to moveable Columns will possess all the advantages of a Transport Train or Baggage Corps with this essential superiority over any such Train that Commanding Officers will have under their own constant observation the Cattle on which they are to depend, and that the instruction of the Drivers of the Cattle will proceed simultaneously with that of the Troops with which they are to be associated on service in the field.

**SOLDIERS PURCHASING DISCHARGE AND RE-ENLISTING  
WITHIN SIX MONTHS, MOIETY OF PURCHASE MONEY TO  
BE REFUNDED.**

*G. O. G. No. 127. 5th. April 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished:—

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.**

*Fort William, the 22nd March 1861.*

**No. 270 of 1861.**—Under authority from her Majesty's Government, it is notified that one moiety of the purchase money paid on account of Soldiers who purchase their discharge, and re-enlist within six months, will hereafter be refunded to the party who paid the same.

**REGULATING THE FEED OF GRAM OF COLONIAL HORSES,  
ARABS AND SMALLER HORSES OF LIGHT CAVALRY AND  
LIGHT FIELD BATTERIES.**

*G. O. C. C. No. 30. 5th April 1861.*—With the Sanction of Government, the Provincial Commander in Chief directs that Colonial Horses shall at all seasons of the year be allowed the full ration of 10lbs. of Gram, but the ordinary feed of Arabs and smaller horses in Regiments of Light Cavalry and Light Field Batteries in Cantonments, is restricted to 8lbs. of Gram per diem.

2. The latter may however be increased at the discretion of Officers Commanding Divisions and Forces, who will distinctly specify, in a report for the Commander-in-Chief's information, the reasons which may in their opinion render an increase desirable.

**PROPORTION OF HORSES FIXED AT 15 PER CENT, BELOW  
THE EFFECTIVE STRENGTH OF THE MEN.**

*G. O. G. No. 133, 12th April 1861.*—Adverting to the Resolution of the Government of India, published in *G. O. G.* dated 22nd March 1861, No. 108, it is directed that in

all Mounted Corps, whether European or Native, the proportion of Horses shall in future be fixed at 15 per Cent below the Effective strength of the Men.

2. The above proportion is fixed as the Established strength of Horses in time of peace, in the Cavalry of the Regular Service, whether European or Native, with this further restriction that, whatever may be the Effective strength of men, the total strength of Horses shall not exceed the numbers stated below.

	Horses.
For a Regiment of British Cavalry.....	500
„ Troop of Horse Artillery.....	175
„ Battery of Royal Artillery.....	120
„ Battery of Indian Artillery.....	105

3. The Provincial Commander-in-Chief is requested to take immediate steps to give effect to the above arrangement.

#### GOOD CONDUCT OF THE MADRAS GOLUNDAUZE IN CHINA.

G. O. G. No. 140, 19th April 1861.—The following Extract from a Military Despatch from the Right Honorable the Secretary of State for India, is published:—

*Despatch dated 16th March 1861, No. 44.*

Para. 10. “I have received, with much gratification, the testimony borne by the Brigadier General Commanding Royal Artillery in China, to the good conduct of the Madras Golundauze, under the Command of Captain Hicks, in several operations of the China Expeditionary Force.”

#### REGIMENTAL LASCARS WHEN TO BE MADE AVAILABLE AS TENT LASCARS.

G. O. G. No. 141, 19th April 1861,—The Governor in Council directs that the following be substituted for para. 3 of G. O. G. 30th March 1860, No. 129.

Para. 3.—Regimental Lascars will hereafter be made available as Tent Lascars on the line of March, or in the Field, and with Detachments of their own Regiments—but

are not to be employed separate from their Regiments on general duties as Tent Lascars either in Garrison or in the Field, except at Stations where there are no Tent Lascars, when a proportion from each Corps may be detailed in orders, for employment under the Station Staff Officer in the preservation and care of Camp Equipage and Equipments in Store at such Stations. At single Stations the duty will be performed under Regimental arrangement.

**KIT MONEY ON RE-ENLISTMENT INADMISSIBLE TO SOLDIERS NOT IN THE PERFORMANCE OF REGIMENTAL OR OTHER MILITARY DUTIES.**

*G. O. C. No. 35, 4th. April 1861.*—The Provincial Commander-in-Chief directs it to be notified with reference to *G. O. G. No. 364*, dated 20th September 1859, that in accordance with the rule obtaining in the Bengal Presidency the grant of Kit money on re-enlistment after the expiration of the first period of Service is inadmissible to Soldiers who are not in the performance of Regimental or other Military duties: for instance, those attached to the Public Works Department, Clerks in Offices, &c.

*A. O. No. 6, 2nd. April 1861.*—II. The Commandant of Artillery has had before him orders which have, from time to time, been issued by different Commanding Officers, on the subject of the men of the Regiment cleaning their arms and accoutrements, unaided by Native servants.

2. There is reason to believe that these orders have been suffered to fall into abeyance.

3. In the present incomplete state of the Regiment as regards men, it would be difficult to carry out, in its integrity, in every Troop or Company, the system of cleaning arms, accoutrements, saddlery, harness, and other appointments, as it exists in the Royal Army; but whenever Commanding Officers conceive that it can be properly done, the Commandant desires that it may be observed.

4. The *Arms* however of the men, especially the Rifled Percussion Pistols and Carbines, (being liable to injury if entrusted to unskilful hands,) must be cleaned by the men themselves; and the Commandant peremptorily forbids Natives being employed in this duty, or having any thing to do with them.

5. Commanding Officers will order Parades daily, or whenever necessary, and occasionally under an Officer, that all may be at first instructed in, and afterwards regularly keep up, the cleaning of the *Arms* of the Troop or Company, of whatever description they may be.

6. Regimental, Troop, and Company Staff and Non-Commissioned Officers only, are exempted from cleaning their Arms at Parade, they being required to exercise superintendence over the Rank and File.

7. This order is to be carried out throughout the Corps, and Officers Commanding Horse Brigade and Battalions will enter, in a N. B. at foot of the body of Monthly Returns, that M. A. O. No. 6, of 2nd. April 1861, is strictly observed *in every Troop or Company of the Brigade or Battalion.*

8. Copies of Commanding Officer's orders issued, giving effect to this order, are to be forwarded for the information of the Commandant at once.

No. 7, 2nd. April 1861—V. The question having been referred to Superior Authority as to whether Bugle Majors and Buglers of the European Battalions of Artillery, being Indo Britons, and whose lineage renders them ineligible for re-enlistment as Europeans, are eligible for the Annuity with medal, and Gratuity with medal, authorized by G. O. G. dated 9th June 1848 No. 123, the following decision of Government thereon is published for general information.

“ ORDER No. 941—12th. MARCH 1861.

“ The Governor in Council concurs in the opinion expressed by the Commander-in-Chief, and the Military

“ Auditor General, that the Bugle Majors and Buglers, referred to in the foregoing correspondence, are eligible to the advantages of the Good Conduct Warrant, as respects Annuity and Gratuity.”

(True Extract.)

(Signed) R. HAMILTON, Lieut.-Col.,  
*Deputy Secretary to Government.*

A. O. No. 8, 11th. April 1861.—II. The following is published for general information and guidance.

No. 672.

#### MEMORANDUM.

Under instructions from Government the Provincial Commander-in-Chief directs it be notified, for information and guidance, that a soldier who re-enlists and is entitled to count former service towards Pension, is not entitled to reckon it towards discharge by indulgence, which he can duly obtain under the provisions of G. O. G. No. 123 dated 9th. June 1848.

ADJUTANT GENERAL'S OFFICE,  
FORT SAINT GEORGE,  
9th April 1861. } (Signed) W. G. WOODS, Lt.-Col.,  
*Adjutant General of the Army.*

#### ARRIVALS.

1861.	<i>Names.</i>	<i>From.</i>	<i>At.</i>
23rd April	Lieut. Col. G. Rowlandson,	Europe	Madras.
27th „	Lieutenant D. Cowie,	Calcutta	„

#### DEPARTURES.

1861.	<i>Names.</i>	<i>From.</i>	<i>To.</i>
4th April	Lieutenant W. Bryden,	St. Thos' Mount	Trichinopoly.
16th „	Lt. Col. (Col.) R. C. Moore,	C. B. Madras	Europe.
28th „	Lieut. H. Featherstonhaugh,	„	„

## PROMOTIONS AND APPOINTMENTS.

1861	<i>Names.</i>	<i>To.</i>	
5th April	Senior Captain (Brevet Major) W. K. Worster,	To be Lieutenant Colonel.	} Vice Mawdsley retired; date of Commissions, 16th January 1861.
	Senior 2nd Captain N. G. Campbell,	To be Captain.	
	Senior Lieutenant R. A. Baker,	To be 2d Captain.	
<i>Memorandum</i> ,—Lieutenant Colonel C. J. Cooke, and Lieut. A. W. O. Whinyates are entitled to the Pay and Allowances of their Rank from the 16th January 1861, in succession to Mawdsley retired.			
5th "	2d Captain F. Cobbe, Executive Engineer, 3rd Class.	} Appointed to the charge of the Nagpore Division.	
9th "	Lieut. Col. G. W. Y. Simpson, Actg. Insp. Genl. of Ord. and Magazines.	} To be Inspector General of Ordnance and Magazines.	
	Capt. (Lt. Colonel) J. L. Barrow, Actg. Prinl Comy. of Ordnance.	} To be Principal Commissary of Ordnance.	
9th "	Captain H. E. Hicks,	To be Major in the Army by Brevet, dated 15th February 1861.	
12th "	Lieut. Colonel W. K. Worster,	—To act as Superintendent of the Gunpowder Manufactory without préjudice to his present appointment, on the departure of Colonel Hamond, and until the arrival from Europe of Lieut. Colonel Rowlandson.	
19th "	2d Captain E. M. Playfair,	—Appointed to Officiate as Cantonment Joint Magistrate of Kamptee during the absence of Captain Dale on leave.	
26th "	2d Captain W. D'O. Kerrich,	—To take rank from 15th December 1860, vice Yeoman, Invalided.	
	" A. R. Gloag,	—To take rank from 28th December 1860, vice Stewart resigned the Service.	
	" R. A. Baker,	—To take rank from 31st December 1860, in succession to Morton promoted.	
	Lieutenant E. W. Childers,	—To be 2d Captain, in succession to Campbell promoted; date of Commission 16th January 1861.	



## MEMO.

The undermentioned Officers of the Artillery are entitled to the Pay and Allowances of their rank, from the dates specified against their names.

Lieutenant C. H. A. Gower,	15th December 1860,	} In supercession of the dates before assigned to these Officers.
	vice Kerrich, promoted.	
„ P. M. Rolland,	28th December 1860,	
	vice Gloag, promoted.	
„ A. W. O. Whinyates,	31st Decr. 1860,	
	vice Baker, promoted.	
„ W. Wyndham,	16th January 1861,	
	vice Childers, promoted.	

## REMOVALS AND POSTINGS.

1861.	Names.	From.	To.
3rd April	Lieut. P. Sanderson, D. Com. 1st Bu. Arty. }	.....	To do duty with the B. Compy. 4th Battalion Arty. at the Mount, until the arrival of his own Company from Rangoon.
		Bn. Co.	Bn. Co.
8th „	2d Capt. G. C. Robinson,	1st D.	2d A. To join.
	„ R. C. Henchy,	2d A.	1st D.
27th „	Lieut. J. G. Marshall, G. Com. 1st Battn. Arty. }	.....	To proceed to St. Thos' Mount and report himself to the Officer Command- ing that Station.

## LEAVE OF ABSENCE IN EUROPE.

1861.	Names.	Remarks.
19th April	Captain A. N. Scott, Com. of Ord. H. S. Force. }	On medical certificate for 15 months under the regulations of 1854, and to embark from Bombay.
23rd „	Lieut. H. Featherstonhaugh.—	For 18 months, under the re- gulations of 1854, and to embark from Madras.
26th „	Captain J. de C. Sinclair,—	Leave extended for 2 months.

## SERVICES.

1861.

19th April Lieutenant T. I. M. Hog, } Services replaced at the  
 Offg. Dep. Commr. of Dumoh. } disposal of the Government  
 of Fort St. George and of the Provin-  
 cial Commander in Chief.

## ORDER OF THE BATH.

1861.

16th April Lieut. Colonel E. Brice, } To be extra Members of the  
 " G. S. Cotter. } Military Division of the 3rd  
 Class, or Companions of the Most  
 Honorable Order of the Bath.

## ORDERS CONFIRMED.

21st March 1861.

31st December 1860.—By the Officer Commanding Ceded Districts, directing Lieutenant Lane, doing duty with the D. Troop Horse Artillery, to take charge of the Bellary Arsenal from the 31st December 1860 without prejudice to the performance of his Regimental duties.

22nd March 1861.

4th October 1859.—By the Officer Commanding Banda, directing Lieutenant H. G. Pritchard of No. 1 Horse Field Battery, to assume command of  $\frac{1}{2}$  the E. Troop Madras Horse Brigade during the illness of Lieutenant J. C. Taylor.

ATTENTION OF COMMANDING OFFICERS REQUESTED TO  
 CANTEEN REGULATIONS IN PREPARING INDENTS FOR  
 SPIRITS AND MALT LIQUOR.

G. O. C. C. No. 38, 1st. May 1861.—The strict attention  
 of Commanding Officers of European Regiments and Detach-

ments is requested to the provisions of the \*Canteen Regulations, in preparing their Indents and requisitions upon the Commissariat Department for both Spirits and Malt liquor.

2. The maximum issue to any one Man, in one day, is fixed in paragraph 22 of the Canteen Regulations, and in no

case will more than the quantities of Arrack and Malt liquor therein laid down, be provided by Government.

3. The Annual requisitions for Malt liquor, required by para. 39 of the Canteen Regulations to be furnished to Commissariat Officers of Divisions, are to correspond as nearly as possible with the year's consumption, and must be confined strictly to the regulated allowances, viz., one quart per man per diem, according to actual strength, *after deducting the average number of sick*, and making due allowance for Men who take two drams of Arrack per diem, and who are not entitled to any Malt liquor.

OFFICERS RETIRING IN EUROPE ALLOWED THE BENEFIT OF THEIR RANK UP TO DATE OF RETIREMENT.

*G. O. G. No. 153, 3rd May 1861.*—The following Extract from a Military Letter from the Right Honorable the Secretary of State for India, is published:—

*Letter dated 30th. March 1861, No. 54.*

I have had under my consideration in Council, the Regulation of the year 1801, under which Officers of H. M.'s Indian Army, who retire in this Country, can only claim the benefit of the rank held by them at the expiration of one year from the date of their landing in the United Kingdom, and being of opinion that the rule in question is not applicable to present circumstances, have resolved that, in future, Officers retiring in this Country, shall be allowed, during a period of two years and a half from their quitting India, when on authorized Furlough, the benefit of the Regimental rank, they may have respectively attained, up to the date of their retirement.

STATEMENT OF SERVICE TO BE FORWARDED TO THE ADJUTANT GENERAL'S OFFICE, WHENEVER AN OFFICER OBTAINS LEAVE TO PROCEED TO EUROPE OR TO RETIRE FROM THE SERVICE.

*G. O. C. C. No. 42, 3rd. May 1861.*—The Provincial Commander-in-Chief directs that whenever any Officer,

(whether at the time serving with his Regiment or on Staff or other employ,) obtains leave to proceed to Europe, or to retire from the service, a statement in the subjoined form, shall be forwarded without delay, by the Officer Commanding his Regiment through the Divisional Commanding Officer to the Adjutant General's Office at the Presidency.

2. In the case of an unposted Officer, the required statement is to be forwarded by the Officer Commanding the Regiment with which he may have been appointed to do duty.

3. The service Statements for Medical Officers will be sent in by the Principal Inspector General Medical Department.

Record of the Services, &c. of \_\_\_\_\_ of the \_\_\_\_\_  
Regiment - \_\_\_\_\_

Rank and Name.	Services in the Field.	Nature of employment during Service. (That is appointment held since entry into the Service.)	Whether conduct has ever been the subject of a Court Martial or Court of Inquiry and with what result.	Remarks.

Station

Signature.

Date.

**WIDOWS OF SOLDIERS VOLUNTEERING FOR THE LINE SERVICE, ENTITLED TO THE BENEFIT OF LORD CLIVE'S FUND.**

G. O. G. No. 156, 7th. May 1861.—Under instructions from the Government of India, the Governor in Council is pleased to notify that, until further orders, the Widows of Soldiers of Her Majesty's Indian Army volunteering for the Line service under G. O. G. No. 151, of the 30th April 1861, will be entitled to the benefits of Lord Clive's Fund, as heretofore.

ORPHAN ALLOWANCE OF SOLDIERS' ORPHANS WHO ACCOMPANY THEIR STEP-FATHERS TO ENGLAND &c.

*G. O. G. No. 165, 14th May 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.

*Fort William, the 30th April 1861.*

No. 381 of 1861.—His Excellency the Governor General in Council is pleased to notify that Soldiers' Orphans, who accompany their Step-fathers to England when the latter proceed on Furlough, will, if still under sixteen years of age, be allowed to resume their Orphan Allowance on returning to India on the expiration of the Step-father's Furlough, or within twelve months after his death, should he die in Europe within the term of his Furlough.

SUMS RECOVERED ON ACCOUNT OF MILITARY ESTATES TO BE PAID TO THE PAYMASTER AT FORT SAINT GEORGE.

*G. O. G. No. 173, 21st May 1861.*—The Governor in Council directs that all sums recovered on account of Military Estates at the Presidency, be, until further orders, paid to the Paymaster at Fort St. George, instead of into the General Treasury as heretofore.

FORM TO BE OBSERVED BY AN OFFICER IN SUBMITTING HIS APPLICATION TO JOIN THE MADRAS STAFF CORPS.

*G. O. C. C. No. 45, 23rd May 1861.*—The Provincial Commander in Chief directs the publication of the subjoined Form to be observed by an Officer in submitting his application to join the Madras Staff Corps, under the provisions of *G. O. G. G. No. 332*, dated 10th April 1861.

2. A supply of Forms will be furnished to Officers Commanding Stations to whom application is to be made for them by Officers doing Regimental duty, and those in Military Staff employ who are desirous of joining the Staff Corps.

3. Officers in Political and Civil employ will receive the Form direct from the Adjutant General of the Army.

4. The Form when filled in may be forwarded direct by the applicant himself to the Adjutant General of the Army at Ootacamund, or wherever Army Head Quarters may at the time be established. These Forms will be verified in the Office of the Adjutant General previous to submission for the approval of the Provincial Commander in Chief and the final decision of Government.

5. Officers who wish to retain their present appointments without joining the Staff Corps under para. 72 can also obtain Forms of application from Officers Commanding Stations.

**FORM.**

TO THE ADJUTANT GENERAL OF THE ARMY, OOTACAMUND,

SIR,—I have the honor to request that I may be placed on the Madras Staff Corps, under the terms of the General Order by Government of India, No. 332, dated 10th April 1861.

	Years.	Months.	Days.
Date of first Commission.....			
Admitted upon the Establishment 18 .			
Total period of service up to 18th Feby. 1861....			

**Staff Service.**

Regtl. Rank at date of nomination to each appointment,	Date of *General Order conferring appointment.	Particulars of appointment.	Date of entering on duties of appointment.	Date on which ceased to perform duties of appointment.	Period.			Remarks.
					Years.	Months.	Days.	
Total period of Service on the Staff.....								

\* Specifying in this column whether G. O. G. or G. O. C. C. &c.

I have the honor to be,

Sir,

Your obedient servant

Station }  
Date. }

*A. O. No. 9, 1st May 1861.*—I. The Commandant of Artillery having had under his consideration the present inconvenient system of indenting for clothing, and in view to obviate, as much as possible, the delay and unnecessary correspondence incident thereon, directs that henceforth Officers Commanding Troops and Companies detached from their Head Quarters forward their Indents, *in duplicate*, direct to the Clothing Agent, and copies only thereof to their own Head Quarters. Whilst this arrangement will have the effect of relieving Officers Commanding Corps of much responsibility, it is not intended to absolve them from exercising control, where they see good and sufficient reason for so doing.

*A. O. No. 10, 1st May 1861.*—II. In M. A. O. No. II of 23rd February 1861, the attention of Officers Commanding Corps was called to Circular No. 826 from the Adjutant General of the Army, to Officers Commanding Divisions.

2. As Officers still forward, for submission to Superior Authority, copies of correspondence, without embodying in their own letter a summary of the case, it is presumed that the Circular alluded to has not been generally made known;—the Commandant therefore deems it necessary to notify that it merely republished the G. O. C. C. No. 59, alluded to in M. A. O. No. II. of 23rd February 1861.

3. The Commandant again calls attention to that order, and directs that the practice therein prescribed, for guidance of Officers corresponding with Army Head Quarters, may also be observed in all future communications with Artillery Head Quarters.

*A. O. No. 11, 8th May 1861.*—I. The following extract from a letter No. 49 dated 4th May 1861, from the Adju-

tant General of the Army, is published for general information and guidance.

“ I have the honor, by order of the Provincial Commander in Chief, to inform you that the Government of India is pleased to sanction\* the grant of Subsistence Allowance to the legitimate children of a European Soldier by a Native woman, even though the mother of such children be not within the authorized complement in a Regiment.”

\* Proceedings Madras Government  
No. 1493 of the 25th April 1861.

“ pleased to sanction\* the  
“ grant of Subsistence

## ARRIVALS.

1861.	Names.	From.	To.
8th May	Lieut. A. C. Davidson, } „ J. H. Gleig, }	Rangoon	Madras
16th „	Captain J. H. Elwyn,	Penang	„

## DEPARTURES.

1861.	Names.	From.	To.
14th May	Lieut. A. J. Lavie,	Madras	Europe.
18th „	„ A. C. Davidson,	„	Bangalore

## PROMOTIONS AND APPOINTMENTS.

1861.	Names.	To.
7th May	Lieutenant C. W. Brereton,—Date of admission upon the Establishment 18th and not 19th December 1858, as notified in G. O. G. 21st Idem, No. 499.	
28th „	Lieut. Colonel T. K. Whistler,—To be Colonel by Brevet, in succession to General P. Delamotte, C.B. Bombay Cavalry, deceased.	
28th „	Captain E. M. Playfair, Offg. Cant. Joint Magistrate of Kamptee. }	Confirmed in that appointment from 16th April 1861.



## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861						
30th April	Capt. C. D. Waddell } D Com. 6th Bn. Arty.)					To do duty with the details of his Battrn. at the Mount until his Company returns to the Coast from Rangoon.
" "	Lt. H. Featherstonhaugh					Removal from D Compy. 2d Battrn. to A. Compy. 4th Battrn. Arty. in G. O. C. C. 2d Feby. last, cancelled.
2d May	Captain J. H. Elwyn } D. Com. 6th Bn. Arty.)			d. & C. Ist.		To do duty at the Mount until further orders.
	Lieut. F. Sanderson...	d. & B.	4th	B.	4th	
	" K. J. L. Mackenzie.	d. & A.	4th	A.	4th	
	Lieut. T. I. M. Hog	D.	3rd	C.	4th	To join.
7th "	" J. C. Taylor					To vacate his appointment in the Horse Artillery from 27th March 1861, having been absent on medical certificate in England beyond the period prescribed in para. 13, G. O. G. No. 358, 6th December 1854.
	" E. W. Childers	D.	5th.	Horse Arty.		

## LEAVE OF ABSENCE IN INDIA.

1861.	Names.	Where and Remarks.
7th May	Lieutenant D. Cowie,	The leave granted in G. O. G. No. 74, dated 5th March 1861, is extended to the 27th April 1861.
21st "	Captain W. C. L. Baker, Com. of Ord. Fort St. George.	Ootacamund and Mysore, in continuation of privilege leave for two months.
2d	Capt. H. G. Thomson.	Thirty days privilege
2d	Asst. Adjt. Genl. of the Army.	leave, from 12th June 1861.
2d	Capt. G. Dangerfield. C. Com. 2d Batt. Arty.	Cuddalore and Madras from 4th June to 4th August 1861.

## LEAVE OF ABSENCE IN EUROPE.

1861.	Names.	Remarks
3rd May	Capt. G. G. J. Campbell.	The leave to Europe on medical certificate granted in G. O. G. G. No. 1138 of 1858, republished in Madras G. O. G. 17th August 1858, No. 330, is to be reckoned from 30th October of that year, the date of his embarkation from Madras, instead of from 11th, August, the date of his departure from Calcutta.

1861.	Names.	Remarks.
3rd May	Lieut. A. J. Lavie.	On medical certificate for 18 months, under the regulations of 1854, and to embark from Madras.

## SERVICES.

1861.

23rd May	Captain E. M. Playfair, Comt. of Arty. Nagpore Ir- regular Force.	} Services placed temporarily at the disposal of the Foreign Department, with effect from the 4th April 1861.
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## ORDERS CONFIRMED.

16th May 1861.

*26th April 1861.*—By the Officer Commanding Hyderabad Subsidiary Force, directing Captain G. B. B. Holmes of the Madras Artillery, to assume charge of the Arsenal at Secunderabad, relieving Captain A. N. Scott on the 1st May 1861, without prejudice to his Regimental duties.

17th May 1861.

*26th April 1861.*—By the Officer Commanding Nagpore Force, authorizing the Officer Commanding A. Troop Horse Artillery, to draw the reduced feed of 9 lbs. 8 ozs. of Gram per diem, for each Horse in the Troop with retrospective effect from the 1st March to the 22nd April, both days inclusive.

ARTICLES OF WAR FOR THE ROYAL FORCES TO BE THE GUIDE IN ESTATE MATTERS IN THE CASE OF OFFICERS AND MEN DYING AFTER VOLUNTEERING FOR THE ROYAL ARMY.

*G. O. G. No. 193, 7th June 1861.*—The following Extract from a Despatch from the Government of India, is published in General Orders :—

“ The Articles of War for the Royal Forces are to be the guide in Estate matters in the case of Officers and men dying after volunteering for the new Royal Artillery and new Cavalry and Infantry Line Regiments.”

“ The regimental accounts connected with Estates must consequently be rendered to the War Department by Regimental Pay Masters, when the new arrangements shall have been made.”

*A. O.*, 17th June 1861—I. The following is published for general information and guidance.

No. 75.

CIRCULAR MEMORANDUM.

The Provincial Commander-in-Chief directs the attention of Commanding Officers to the provisions of para: 2 of the Republished in G. O. C. C. dated 17th August 1855. G. O. G. No. 7 dated 9th January 1855, and requests that due observance may be given to the rules laid down in the above para. Estimates for Malt Liquor being submitted punctually on the 1st of May.

ADJUTANT GENERAL'S OFFICE,  
HEAD QUARTERS OOTACAMUND,  
13th June 1861.

(Signed) W. G. Woods, Lieut. Col.  
*Adjutant General of the Army.*

ARRIVALS.

1861.	Names.	From.	At.
8th June	Lieut. J. G. Marshall,	Cannanore	St. Thomas' Mount.
13th „	„ H. McLeod	Europe	Madras.
16th „	„ W. M. D. Wright,	Moulmein	„
„	„ W. E. Lockhart,		
19th „	„ A. C. Davidson,	Bangalore	St. Thomas' Mount.
22nd „	Captain J. De C. Sinclair,	Europe	Madras.

PROMOTIONS AND APPOINTMENTS.

1861	Names.	To.
	<i>To be Colonels Commandant.</i>	
4th June	Colonel (General) E. M. G. Showers.....	} To complete the Establishment.—Date of Commissions, from the date on which they respectively received the Colonels allowance.
	do. (Lt. Genl.) W. Cullen.....	
	do. ( ditto ) J. Ketchen.....	
	do. ( ditto ) P. Montgomerie, C. B.	

1861.

*Names.*

*To.*

*To take rank as Colonels Commandant.*

4th June	Colonel (Major Genl.) G. Conran.....	} From the date on which they respectively received the Colonels allowance.
do.	( ditto ) F. F. Whinyates.....	
do.	( ditto ) Æ. Shirreff.....	

*To be Colonels.*

Senior Lt. Col. (Bt. Col.) J. W. Croggan...	} To complete the Establishment,—Date of Commissions 18th February 1861.
do. do. T. K. Whistler.....	
do. do. (Bt. Col.) R. C. Moore, C. B.	
do. do. G. W. Y. Simpson.....	
do. do. G. Briggs.....	
do. do. J. Maitland, vice Simpson, seconded.....	
do. do. (Bt. Col.) G. Balfour, C. B., vice Maitland, seconded....	

*To be Lieutenant Colonels.*

Senior Capt. (Bt. Col.) W. M. Gabbett.....	} To complete the Establishment.—Date of Commissions 18th Feb'y 1861.
do. (Bt. Major) J. Babington.....	
do. (Bt. Lt. Col.) J. L. Barrow.....	
do. (Bt. Major) G. P. Eaton.....	
do. (Bt. Lt. Col.) J. D. Mein.....	
do. (Bt. Major) J. G. Balmain.....	
do. ( do. ) G. Selby.....	
do. ( do. ) A. W. Macintire, C. B...	
do. ( do. ) T. H. Campbell.....	
do. J. D. Scott, vice Rowlandson, seconded.	
do. H. C. Wade, vice Barrow, seconded.	

The undermentioned Supernumerary Captains are brought on the Establishment from the 18th February 1861.

W. S. Mann, vice Gabbett.....	} Promoted.
C. M. J. Thornton, vice Babington.....	
W. F. B. Laurie, vice Barrow.....	
J. De C. Sinclair, vice Eaton.....	
G. Carleton, vice Mein.....	
(Bt. Lieut. Col.) R. Cadell, vice Balmain...	
E. W. Dance, vice Selby.....	
C. Desborough, vice Macintire.....	
R. Morton, vice Campbell.....	
N. G. Campbell, vice Scott.....	

1861.

Names

To.]

*To be Captains.*

4th June Senior 2nd Capt. J. R. J. Robertson, vice Wade, promoted.....	}	Date of Commissions, 18th February 1861.
do. do. R. G. F Henegan, vice Baker, seconded.....		
do. do. P. D. Horne, vice A. N. Scott, seconded.....		
do. do. J. R. Magrath, vice Stewart, seconded.....		

The undermentioned Supernumerary Second Captains are brought on the Establishment from the 18th February 1861.

M. B. S. Lloyd, vice Robertson.....	}	Promoted.
F. L. Playfair, vice Henegan.....		
W. D'O. Kerrich, vice Horne.....		
A. R. Gloag, vice Magrath.....		
R. A. Baker, vice Thomas, seconded.....		

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861 12th June	Lt. Col. G. P. Eaton.....	late promotion	d. d.	1st		Now at Kamptee, to join on being relieved by Captain Molesworth. To Command the Division of Artillery in Pegu. To join at Secunderabad. To join at Bangalore. To join at Mount. On being relieved from Staff duty.
	" J. D. Mein.....	do.	d. d.	2d		
	" G. Selby.....	do.	d. d.	2d		
	" A. W. Macintire, C. B.....	do.	d. d.	4th		
	" T. H. Campbell.....	do.	d. d.	3rd		
	" H. C. Wade.....	do.	d. d.	1st		
	Capt. A. T. Cadell.....	B. H. A.	C.	H. A.		
	" A. V. Falls.....	C. C. 1st Bn. d. d. B. Troop H. Arty.	B.	H. A.		
	" H. T. Molesworth.....	F. H. A.	A.	H. A.		
	Lieut. W. H. McCausland.....	A. C. 5th Bn. d. d. H. Art.		Horse Arty.		
	" B. Yaldwyn..... B. Compy. 5th Batta. Artillery.....	...	...	.....		
25th "	Capt. A. T. Cadell.....	C.	H. A.	A.	H. A.	To proceed forthwith to do duty with A. Company 3d Battalion Artillery and No. 2 Horse Field Battery.
	" H. T. Molesworth.....	A.	H. A.	F.	H. A.	
	1st Capt. G. G. J. Campbell.....	F.	H. A.	A.	H. A.	
	" A. R. Gloag.....	D.	4th	B.	2d	
26th "	" G. Dangerfield.....	C.	2d	B.	1st	

## LEAVE OF ABSENCE IN EUROPE.

1861.	Names.	Remarks.
25th June	Lt. Col. (Col.) W. M. Gabbett,	} Leave extended for six months.
"	G. S. Cotter,	
	Lieut. F. S. Budd,	
"	C. D. A. Straker,	Leave extended for five months.
18th "	" T. W. Roberts,—	On medical certificate for 18 months, under the regulations of 1854, from date of embarkation at Singapore.

## ORDERS CONFIRMED.

30th May 1861.

*27th April 1861.*—By the Officer Commanding Division of Artillery in Pegu, appointing 2d Captain G. C. Robinson of the A. Company 2d Battalion Artillery, Adjutant and Quarter Master of the Division of Artillery in Pegu, vice 2d Captain G. F. Blair, removed from the Division.

*21st May 1861.*—By the Brigadier Commandant Madras Artillery, appointing 2d Captain J. Mc K. Macintyre of the B. Company 3d Battalion Artillery, to act as Adjutant and Quarter Master of that Battalion during the absence on other duty of 2d Captain and Adjutant G. F. Blair.

PENSIONERS NOT ALLOWED TO ALTER THEIR ELECTION OF PLACE OF RESIDENCE UNLESS UNDER VERY URGENT CIRCUMSTANCES.

*G. O. C. C. No. 53, 1st July 1861.*—In consequence of the number of applications which of late have been made to Government to recall Pension Certificates of men who originally selected to reside in other Presidencies, and subsequently desired to draw their Pensions in the Madras Presidency, the Provincial Commander-in-Chief under instructions from Government directs that it be clearly explained to all Soldiers and others when about to be pensioned that while His Excellency the Governor in Council is willing to afford every facility to Pensioners to select their own place of residence, they should do so after due deliberation and that after their elec-

tion has once been made and the necessary communications addressed to the other Governments, they will not be allowed to alter their election unless under very urgent circumstances.

**ALLOWANCE OF RUPEES 400 PER MENSEM TO AN OFFICER SUCCEEDING BY SENIORITY TO THE TEMPORARY COMMAND OF A BRIGADE &c.**

*G. O. G. No. 218, 2nd. July 1861.*—Under instructions from the Government of India, the Governor in Council is pleased to declare the rule in the G. O. by the Government of India, dated 31st January

\* Republished in G. O. G. No. 77, 1860,\* granting to a Regimental Officer not Com-

manding his Regiment an Allowance of Rupees 400 per mensem as Staff, when succeeding by Seniority to the temporary Command of a Brigade, equally applicable, under similar circumstances, when assuming temporary Command of a Station, the Head Quarters of a Division, during the absence of the General Officer on duty.

**DIRECTING THE EARLY TRANSMISSION OF PROCEEDINGS OF MEDICAL INVALIDING COMMITTEES.**

*G. O. C. C. No. 57, 2nd July 1861.*—The Provincial Commander-in-Chief directs that Officers Commanding Divisions and Forces, will issue instructions to Officers Commanding Regiments, Medical Officers, and others serving under their Command to ensure the early transmission to the Adjutant General's Office, of all Proceedings of Medical Invaliding Committees, on the duty being completed; and to direct that the Certificates required by Regulation, for instance in the cases of Men wounded, or injured in the execution of their duty, or whose disqualification is attributable to the Foreign Service on which they have been employed, &c.,—be invariably attached to the Proceedings, so that the State be not put to unnecessary expense by the retention of Men on the Effective List, after they have been pronounced unfit for further service.

MONEY PAYMENT IN LIEU OF QUARTERS TO MARRIED EUROPEAN SOLDIERS.

G. O. G. No. 223, 5th. July 1861.—His Excellency the Governor in Council is pleased to notify that, pending the erection of Married Quarters, the Government of India have sanctioned a money payment in lieu of Quarters to Married European Soldiers, within the authorised limit of 12 per cent. (exclusive of Non-Commissioned Officers) who may not be provided with Public Quarters.

2. The average monthly payment on this account is in no case to exceed Rupees 3 per man for the entire number of Non-Commissioned Rank and File drawn for, and *within that amount* will be payable under the following circumstances, viz.

I. To men hiring houses, the rent actually paid by them.

II. To men occupying their own houses, a rateable sum to be fixed by a Committee with reference to the value of the houses.

3. Committees will accordingly be assembled without delay for the purpose stated in Clause II. of para. 2, of this order at all Stations where required, an abstract of their Proceedings shewing the rates of rent fixed being forwarded to Army Head Quarters (Quarter Master General's Department) for record.

4. In no case will charges for repairs be admissible, against the Government.

5. Bills for rent will be forwarded to the Quarter Master General monthly for sanction, with a declaration at foot to the following effect, viz.

“ I certify that no public Quarters were available during  
 “ the past month for the men drawn for in this Bill;—that  
 “ all those included in it are entitled to the allowance as  
 “ specified against their respective names; and that the rent  
 “ charged is the lowest for which suitable Quarters could be  
 “ obtained.”



6. With reference to this order, the provisions of G. O. G. No. 437 of 1858, are cancelled, and the future sale of Houses, owned by European Soldiers, on their vacation or abandonment, will be a matter of private arrangement.

7. The provisions of this order, will have effect from the 1st of July 1861.

### ERRATA.

- " MISCELLANEOUS" in the number for June.
- page 78, in the 9th line, *for* " bears" *read* " bear".
- „ 78, „ 14th „ *for* " 1,  $\frac{2}{5}$ ,  $\frac{2}{3}$ , *read* " 1,  $\frac{2}{5}$ ,  $\frac{2}{3}$ .
- „ 78, „ 15th „ put a comma after "  $\frac{1}{2}$ ," and erase the comma after the word " difference."
- „ 78, „ 24th „ *for* " measure" *read* " manœuvre."
- „ 81, „ 5th „ after the word " then" put the letter *P*.
- „ 81, „ 6th „ after the word " to" put the letter *W*.
- „ 81, „ 7th „ *for* " weights" *read* " weight."
- „ 81, „ 14th „ *for* " action" *read* " traction."
- „ 81, „ 16th „ *for* " or 4 feet" *read* " or the wheel is 4 feet."

ciency has been proved and certified to the said Commission of the Governor General in Council from Departmental promotion temporary or permanent.

In such cases the absent Officer will not, till he resumes charge of his duties, have any claim to the salary of the higher office, which will be drawn by the Acting Officer.

**GOVERNMENT ALLOWANCE TO REGIMENTAL BANDS EXEMPTED FROM PAYMENT OF INCOME TAX.**

*G. O. C. C. No. 58, 16th July 1861.*—The Provincial Commander in Chief directs it to be notified that the Government allowance made to Regimental Bands has, under the authority of Government, been exempted from the payment of Income Tax, in like manner with that of Regimental Messes, as notified in G. O. G. 9th April 1861, No. 131. Such sums as have already been levied on account of Income Tax on Regimental Band Allowance will accordingly be refunded to Corps.

**MEN TAKING DISCHARGE FROM THE NATIVE ARMY FOR THE PURPOSE OF ENLISTING IN A EUROPEAN REGIMENT, PERMITTED TO RECKON PREVIOUS SERVICE AFTER THE AGE OF 18.**

*G. O. C. C. No. 59, 16th July 1861.*—With reference to Clause IV, para. 8, Section XVII, of the Revised Pay and Audit Regulations, the Provincial Commander in Chief, under the authority of Government, directs it to be notified that men who take their discharge from the Native Army for the express purpose of enlisting in a European Regiment, are permitted to reckon their previous service after the age of 18, as if they had passed it in a European Regiment.

**RATE OF PENSION OF EUROPEAN SOLDIERS WHO ELECT TO RESIDE IN INDIA BE EXPRESSED IN INDIAN CURRENCY.**

*G. O. G. No. 245, 23rd July 1861.*—The Governor in Council directs that, in notifying the transfer to the Pension Establishment, of European Soldiers who elect to reside in *India*, the rate of pension be in future expressed in Indian, and not in English currency.

**REPORTS TO BE MADE TO THE SECRETARY TO THE SAVINGS' BANK OF THE EMBARKATION OF MEN HAVING MONEY IN THE BANK.**

*G. O. C. C. No. 62, 23rd July 1861.*—Considerable delay having in some cases occurred in the transmission to the Home authorities of the Savings' Bank Balances of Soldiers

who have left the service and proceeded to England, and the Secretary to the Government Savings' Bank having represented that this delay has been occasioned by that Officer having received no report of the embarkation of the Depositors, the Provincial Commander in Chief directs that Officers Commanding European Regiments of Her Majesty's British and Indian Forces, make an immediate report to the Secretary to the Savings' Bank of the embarkation of such of their Men as have money in the Bank, on intimation being given them by the Fort Adjutant Fort Saint George, that such Men have been placed under his orders for embarkation.

**REPORTS OF OFFICERS OR SOLDIERS BEING IMPRISONED TO BE MADE TO THE MILITARY AUDITOR GENERAL AND CONTROLLER OF MILITARY FINANCE.**

*G. O. C. C. No. 63, 25th July 1861.*—The Provincial Commander in Chief, directs that Officers Commanding Regiments and Heads of Departments, on all occasions of an Officer or Soldier under their orders being imprisoned, the cause of the same not being shewn in the regular monthly muster Rolls, shall report to the Military Auditor General and Controller of Military Finance both the circumstances of the imprisonment and the dates of arrest and release, in order to the case being submitted for the orders of Government, as prescribed in page 187, "Imprisonment" Article 21, of the revised Pay Code.

*A. O. 2nd July 1861.*—III. Under authority of the Military Finance Department, conveyed with No. 1655 dated 24th June 1861 from the Inspector General of Ordnance and Magazines, the bursting charge of the 12 Pounder common shell will be increased from 5 to 6 ounces of Powder.

IV. Under authority of the Military Finance Department, conveyed with No. 1748 dated 25th June 1861 from the Inspector General of Ordnance and Magazines, sanction is accorded for the substitution of 1 oz. leaden balls, in place of 4 ozs. iron ones hitherto used, in the Case shot of Mountain Train Batteries.

*A. O. 8th July 1861.*—I. The attention of Officers Commanding Light Field Batteries is called to G. O. C. C. No. 2 of 11th January 1861.

2. The Commandant of Artillery directs that the date on which the Statements referred to are forwarded to the Adjutant General of the Army, be entered in an N. B. at foot of the Monthly Return to this Department.

*A. O. No. 12, 11th July 1861.*—II. With reference to M. A. O. No. 6. of 2nd April 1861, the Commandant of Artillery directs that, until Commanding Officers are satisfied that their men know how to clean their Arms, Appointments, and Saddlery, Parades be ordered for the purpose.

2. The Harness of Troops and Batteries will, for the present, be cleaned as heretofore.

3. When Carbines are not regularly in use, fatigue parties are to be told off to clean them;—these parties will be under charge of Troop Quarter Master Serjeants, and Staff Brigade Serjeants of Companies.

4. In Horse Field Batteries all men not exempted by para. 6 of M. A. O. No.  $\frac{6}{11}$ , will assist in cleaning Saddles, though men to whom they are told off are to be held responsible for their state.

5. Men using Saddles, Carbines, &c. on any particular duty, are to clean them.

6. All cleaning of Saddles, Harness, Arms, and Appointments, must be completed before 1 P. M. Roll Call.

*A. O. 15th July 1861.*—II. The following is published for general information.

CIRCULAR MEMORANDUM.

HORSE GUARDS S. W.

9th May 1861.

*Honorary Distinctions,*  
2—(1861)

General No. 131.

His Royal Highness the General Commanding in Chief

has directed the annexed list of the respective prices of Foreign decorations, bestowed upon British Troops, to be promulgated for the information of Commanding Officers who may be called upon, in furtherance of a sentence by Court Martial, to place Soldiers under stoppages for pawning, or otherwise wilfully making away with, such honorable distinctions.

It is to be distinctly understood, that this information is circulated for the above purpose only; and that His Royal Highness has no means of replacing a lost decoration, bestowed by a Foreign Power, under whatever circumstances it may be missing.

(By Command)

(Signed) J. YORKE SCARLETT,  
*Adjutant General.*

*Price of Foreign Decorations bestowed on British Troops.*

French Legion of Honor.....	£.	„	12	6
French Crimean War Medal.....		„	11	8
Turkish do. do. ....		„	3	9
Sardinian do. do. ....		„	4	10

A. O. No. 13, 16th July 1861.—I. It has been notified from Army Head Quarters that clause IV, para. 8, Section\*

\* Permitting former service, after the age of 18, to be reckoned by men transferred to the European Army from Native Regiments.

XVII, of the Revised Pay Code, is appli-

cable to all men who have been transferred from the Native Army to the European branch of the Regiment of Artillery.

2. In connection with the foregoing, the following Proceedings of Government No. 2278 dated 4th July 1861, are published for general information and guidance.

## MILITARY DEPARTMENT.

## PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following letter:—

*From the Secretary to the Government of India, Military Department, Fort William, 17th June 1861, No. 930; to the Secretary to Government, Military Department, Fort Saint George.*

With reference to the enquiry submitted in your letter No. 489, of the 6th February 1861, I am directed to acquaint you, for the information of the Government of Fort Saint George, that the Right Honorable the Governor General in Council is pleased to determine that men who take their discharge from the Native Army for the express purpose of enlisting in a European Regiment, shall be permitted to reckon their previous service, after the age of 18, as if they had passed it in a European Regiment.

No. 14, 16th July 1851.—II. The question having arisen as to whether Mounted Officers, when ordered to March past with Swords undrawn, should salute with the hand, the following is the decision of the Provincial Commander in Chief on the subject.

“As a general rule, Mounted Officers, when marching past with Swords not drawn, do not salute with the hand.”

## DEPARTURES.

1861.	Names.	From.	To.
8th July	2d. Capt. A. R. Gloag,	St. Thomas' Mount.	Madras for embarkation to Waltair.
14th „	Lient. P. Sanderson,	Madras	Europe.
20th „	Lt. Col. J. Babington,	St. Thomas' Mount.	Madras and Bangalore.

## PROMOTIONS AND APPOINTMENTS.

1861.	Names.	To
19th July	Captain H. E. Hicks,	Promotion as Major in the Army to bear date 15th February 1861, and not 1851, as stated in the <i>London Gazette</i> of 24th May 1861.

1861.	<i>Names.</i>	<i>To.</i>
30th "	Lieut. Col. G. Rowlandson,—	Will conduct the duties of the Gun Carriage Manufactory, during the absence, and on the responsibility of Colonel Maitland.

## REMOVALS AND POSTINGS.

1861.	<i>Names.</i>	<i>From.</i>	<i>To.</i>
1st July	Lieut. W. M. D. Wright, B. Compy. 1st Battalion Artillery.	.....	{ do duty Head Quarters 1st Battn. Arty. }
	Lieut. D. Cowie.,	{ doing duty Recruit Depot. }	{ B. Com. 4th Bat- talion Arty. and No. 8, Horse Baty. }
20th July	Capt. B. C. Hitchins,	{ A. Com. 5th Battn. d. d. Hd. Qrs. 5th Battalion. }	{ E. Compy. 5th Battn. to join at Penang. }

To join.

## LEAVE OF ABSENCE IN INDIA.

1861.	<i>Names.</i>	<i>Where and Remarks.</i>
12th July	Lieut. F. R. Twynam.—	Bangalore S. C. from date of departure till 31st October 1861.
8th July	Lieut. Col. J. Babington,—	Bangalore, Coorg and Neilgherries, from 20th July 1861 to 1st October 1861.
17th "	2d. Capt. H. G. Thomson, 2d. <i>Aust. Adj. Genl. of the Army.</i>	} <i>Privilege leave for 60 days,</i> } from 12th June 1861.
30th July	Colonel J. Maitland, <i>Supt. Gun Carriage May.</i>	
24th July	2d. Capt. G. Dangerfield,—	The leave granted in G. O. C. C. 20th May 1861, is to be considered as having effect from the 3d. instead of the 4th June 1861.
24th "	Captain W. C. L. Baker, <i>Com. of Ord. Fort St. George.</i>	} Ootacamund, in continuation till } 1st October 1861.

## LEAVE OF ABSENCE IN EUROPE.

1861.	<i>Names.</i>	<i>Remarks.</i>
6th July	Lieut. P. Sanderson.—	On medical certificate for 18 months, under the new regulation of 1854, and to embark from Madras.
26th "	Lieut. Col. W. A. Orr, c. a.	Leave extended for 6 months.

## ORDERS CONFIRMED.

25th June 1861.

1st June 1861.—By the Officer Commanding Mysore Division, directing Lieutenant W. R. Caine, D. Troop Horse Artillery to remain at Bangalore and do duty with Horse Brigade Artillery as a temporary arrangement, in consequence of the prevalence of Cholera along the road to Bellary.

26th July 1861.

23th June 1861.—By the Officer Commanding Nagpore Force, directing Lieutenant Colonel Mein to join and do duty with the 2d. Battalion Artillery, from the 28th June 1861.

APPLICATIONS FOR ADMISSION TO THE STAFF CORPS,  
THROUGH WHOM TO BE MADE.

G. O. C. C. No. 64, 1st August 1861.—With reference to para. 4, G. O. C. C. No. 45, dated 23rd May 1861, authorising applications for admission to the Staff Corps being submitted direct by the applicants themselves, the Provincial Commander in Chief directs that the applications of Officers not coming under the provisions of paras. 73 or 78, of G. O. G. G. 10th April 1861, No. 332, be sent through Officers Commanding Regiments and Divisions, accompanied by the Certificates required by paras. 79 and 80, of the said order. The period of Regimental service prescribed by para. 80 is exclusive of all leave, privilege or otherwise.

## FREE PASSAGE TO ENGLAND FOR CHILDREN OF EUROPEAN SOLDIERS (THE FATHERS BEING ALIVE IN INDIA.)

G. O. G. No. 254, 2nd August 1861.—The following General Order by the Government of Bombay, is republished, and declared applicable to this Presidency :—

*Bombay Castle, 30th May 1861.*

No. 304 of 1861.—“ Free passage to England will be granted for the Children of European Soldiers, (the fathers being alive in India,) provided that proper arrangements are made for their care and reception in England. No second claim for a return passage will be allowed, nor will Govern-



ment allowance be admitted for them on their return to India, although the expense of the passage be defrayed from private sources."

**DECLARATION REQUIRED FROM WIDOWS IN RECEIPT OF PENSIONS FROM LORD CLIVES FUND.**

*G. O. G. No. 261, 6th August 1861.*—The Governor in Council is pleased to notify that the Right Honorable the Secretary of State for India has authorized the substitution of a declaration of *continued* Widowhood, made before a Minister, Magistrate, or the Officer Commanding a Station, for the Affidavit at present required from Widows in receipt of Pensions from Lord Clive's Fund.

**RATES OF PAY TO BE DRAWN BY OFFICERS OF THE STAFF CORPS.**

*G. O. G. No. 262, 6th August 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished:—

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William the 19th July 1861.*

No. 636 of 1861.—Pending the notification of the consolidated rates of salaries to be established for the several Staff appointments, Officers of the Staff Corps are to draw the rates of pay assigned to the several Ranks by Her Majesty's Warrant of the 16th January 1861, with effect from the 18th February last.

Those who draw consolidated salaries will receive the salaries they have drawn heretofore.

Those who draw consolidated allowances, with pay proper in addition, will be entitled to the present rates of pay proper, but in the Rank they hold in the Staff Corps.

Officers who draw pay and allowances, in addition to Staff salary, will draw the scale of pay laid down in her Majesty's Warrant, according to their Rank in the Staff Corps, and their Staff salaries as heretofore.

Those Officers on Field Allowances who have joined the Staff Corps in the Rank they previously held will be allowed, as a special charge, the difference between the Staff Corps scale, and the full Batta rate of pay and allowances.

Presidency House Rent, where heretofore allowed, will be passed to Officers of the Staff Corps at the usual rates.

**FREE PASSAGE TO SOLDIERS AND SEPOYS &c. PROCEEDING TO AND FROM PORTS ON THE EASTERN COAST, IN GOVERNMENT VESSELS.**

*G. O. G. No. 271, 16th August 1861.*—The Governor in Council is pleased to notify that the rule published in *G. O. G. 11th October 1859, No 393*, and the note to para, 167, Page 423 of the Revised Pay Code (1861) founded thereon, allowing free passage by the Mail Steamers to Soldiers and Sepoys, &c., proceeding to and from Ports on the Eastern Coast of this Presidency, are applicable only to Passages provided on Government Vessels.

**BEDDING AND BLANKETS OF SOLDIERS ABOUT TO EMBARK FOR ENGLAND TO BE SURVEYED BEFORE LEAVING THEIR CORPS OR STATION.**

*G. O. C. C. No. 66, 16th August 1861.*—With reference to para. 14, *G. O. C. C. 15th November 1859, No. 114*, (Section, "Bedding") the Provincial Commander in Chief directs that the Bedding and Blanket of every *Invalid* Soldier about to embark for England be submitted to survey before he leaves his Corps or Station: and if found sufficiently serviceable for the voyage he is to be made aware that he is responsible for these articles as he is for his Regimental necessaries, and that if he makes away with them previous to embarking he will render himself liable to punishment and in addition thereto, will be charged with the cost of the Bedding and of *one* of the *two* Blankets which, in that case, will be supplied for his use on boardship.

2. Under instructions from Government, the Provincial Commander in Chief further directs with reference to the

same para. of the above quoted order that the Bedding and Blanket in use with every Pensioner, and Effective Soldier under orders for discharge (either by purchase or as Time expired) and about to be embarked for England, be in like manner submitted to survey before he leaves his Corps or Station, so as to ensure that each of these classes will take with him the Bedding and Blanket he has in use if serviceable; or, if otherwise, that he should be provided with the regulated Bedding and one Serviceable Blanket for the voyage. These men will, as in the case of the Invalid Soldier, be warned of what they are liable to, should they make away with either Bedding or Blanket which on Survey may have been declared sufficiently serviceable for the voyage.

3. Officers Commanding Regiments will be held directly responsible for any deviation that they may permit from this order.

4. The provisions of this order are applicable to men of the Effective Supernumeraries as well as to those doing Regimental duty.

DOCUMENTS WHICH REQUIRE A STAMP ON BEING PRESENTED OR FILED IN MILITARY COURTS OF REQUESTS.

*G. O. C. C. No. 68, 17th August 1861.*—Under instructions from Government and with reference to *G. O. G. 22nd February 1861, No. 61*, republishing a Notification from *Calcutta Gazette*, dated Fort William, 8th February 1861, No. 272, the Provincial Commander in Chief directs it to be notified that European as well as Native Military Courts of Requests are Civil Courts within the meaning of Act XXXVI of 1860: and that when Petitions or other Proceedings in writing, which under Schedule B of the Stamp Act require a Stamp on being presented or filed in the Ordinary Civil Courts, are presented or filed in such Military Courts of Requests, such documents must bear the Stamp appropriated to them by that Schedule.

NAMES OF OFFICERS APPOINTED TO THE STAFF CORPS,  
TO BE ENTERED IN *RED INK* IN MONTHLY RETURNS  
OF THEIR OLD REGIMENTS.

*G. O. C. C. 69, 20th August 1861.*—The Provincial Commander in Chief directs that the names of Officers who may be appointed in General Orders to the Staff Corps, be entered in *Red ink* in the "List of Officers Corresponding" of the Monthly Returns of their old Regiments.

*A. O. 15th August 1861.*—III. The following *G. O. C. C.* by His Excellency the Commander in Chief in India, is published for general information.

*Head Quarters, Calcutta, 17th May 1861.*

The following Army General Order is published for information.

*Adjutant General's Office, Simla, 1st May 1861.*

In continuation of the General Orders of the 6th February and 15th September 1860, the Commander in Chief is pleased to re-publish the following letter from the Horse Guards, and to direct that it be made applicable to the European Corps of the Bengal Army.

CLASSIFICATION OF SOLDIERS.

*HORSE GUARDS, S. W., 23rd January 1861.*

SIR,

Having submitted to His Royal Highness the General Commanding in Chief your letter of the 1st ultimo, with its enclosures, having reference to the interpretation of the Horse Guards General Order of 9th November 1859, as regards the correct classification of the crime of disobedience of which Private Richardson, 34th Foot, was convicted by Court Martial, I have it in command to observe that an act of disobedience amounts to insubordination; but the nature of that disobedience must determine the class in which the offender is to be placed. An act of simple insubordination belongs to the category of crime specified under the first

head; on the other hand, aggravated insubordination is classified under the 2nd head.

I have &c.

(Signed) A. HORSFORD,  
*Deputy Adjutant General.*

(Signed) W. MAYHEW, Lieut. Col.,  
*Adjutant General of the Army.*

*A. O. 19th August 1861.*—I. The Commandant of Artillery directs the following entry to be made in the Register, and Small account book, of every man who has volunteered for the Royal Artillery under G. O. G. G. No 332 of 10th April 1861.

“ Volunteered for General service in the Royal Artillery, on (*date*) at (*station*).”

(Signed)———Captain,  
*Commanding Troop or Company.*

*A. O. 22nd August 1861.*—I. The following is published.

### MILITARY DEPARTMENT.

#### PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following,

*Military Despatch from the Right Honorable the Secretary of State for India; India Office, London, 24th June 1861, No. 127.*

1. I beg to inform your Excellency that drafts of the Royal Artillery as follows, viz. 150 Gunners and 150 Drivers, will be dispatched to your Presidency in the course of the present summer, accompanied by 3 Serjeants, 8 Corporals, and 10 Bombardiers.

2. These will be disposed of in completing the Batteries and Garrison Companies of the new Brigades of Royal

Artillery, to be formed out of the Madras Artillery, on the Establishment that may be determined upon for the Artillery generally; and should there be more than sufficient men for this purpose, a commencement may be made in the formation of new Batteries, or Companies, in gradual replacement of the Native or Golundaūze Companies of Artillery.

3. I request that it may be borne in mind, in forming the new batteries, to reserve places for the Non Commissioned Officers above mentioned; and it is the wish of His Royal Highness the General Commanding in Chief that care should be taken, in future, to keep open sufficient vacancies every year, at the time drafts may be expected to arrive in India, for a similar proportion of Non Commissioned Officers proceeding with such drafts.

4. His Royal Highness observes, that the system of occasionally introducing Non Commissioned Officers from Home into Batteries serving in India, has worked admirably in the Royal Artillery, and it is therefore desirable that it should be extended to the new Brigades.

ORDER No. 2639, 26th JULY 1861.

Communicated to the Provincial Commander in Chief, (Adjutant General's and Quarter Master General's Departments, and Deputy Adjutant General Her Majesty's British Forces,) Military Auditor General, and Clothing Department.

(True Extract.)

(Signed) H. MARSHALL, Colonel,  
*Secretary to Government.*

2. With reference to the foregoing, and under instructions from Army Head Quarters, Officers Commanding Corps will reserve vacancies, for the reception of the Non

Commissioned Officers &c. now on the passage from England, in the following proportions.

Corps.	Serjeants.	Corporals.	Bombardiers.
Horse Brigade, for ...	1	2	2
1st Battalibn " ...	1	1	2
2nd " " ...	1	1	2
3rd " " ...	.....	2	2
4th " " ...	.....	2	2

II. To ensure uniformity throughout the Corps, the Commandant directs that the Buttons on the Shoulder and Breast of the White Tunic, be of the pattern worn by Officers and men on their respective Stable Jackets

A. O. 29th August 1861.—I. Under instructions from Army Head Quarters, Officers Commanding Corps, Troops, and Companies, will transmit

Conveyed in letter No. 3423 dated 24th August 1861, from the Adjutant General of the Army.

the Returns called for by letter No. 3280 of the 17th instant from the Adjutant General of

the Army, direct to the Assistant Adjutant General of Artillery immediately after the Monthly Musters are taken.

2. The Returns from Officers Commanding Corps are to include the European ranks *belonging to the Head Quarters of the Brigades or Battalion only*; and those from Officers Commanding Troops and Companies, all European ranks under their command.

3. These Returns are to be furnished retrospectively from the 1st April last, with the least practicable delay.

#### ARRIVALS.

1861	Names...	From...	At...
28th Aug.	Lt. Col. (Col.) W. M. Gabbett	Europe.	Madras.

## DEPARTURES.

1861	<i>Names.</i>	<i>From.</i>	<i>To.</i>
8th Aug.	Captain B. C. Hitchins	St. Thos' Mount.	Madras for embarkation to Penang.
15th "	2d Capt. A. R. Gloag	Madras.	Waltair.

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861						
8th Aug.	Capt. J. H. Elwyn.....	D. d. C.	4th-1st.	C. 1st		
	2d Capt. E. S. Milman	D. H. B.	H. B.	C. H. B.		
	" E. W. Childers	H. B. unposted d. d. with the Hd. Qrs.	H. B.	F. H. B.		To join at Bangalore.
	Lieut. W. H. McGausland	do.	do.	do.	do.	To join at Bangalore.
	" I. Ketchen.....	do.	do.	C.	do.	To join at Bangalore.
	" A. P. Bainbridge	A. d. d. Recruit Depot.	4th.	C.	2d	To join at Trichinopoly.
	" M. H. C. B. Steinman	d. d. Hd. Qrs. H. Brigade.		d. d. C.	H. B.	To join at Bangalore.
	" R. Hamond.....	do.	od.	do.	do.	To join at Bangalore.
	" H. G. Pritchard.	do.	do.	d. d. A.	H. B.	To continue to do duty at Bangalore until 1st November 1861, and then to join the A. Troop at Kamptee.
	" W. Bryden.....	B. d. d. C.	4th. 2nd	C.	2d	
	" D. W. Lawrell...	d. d. Recruit Depot.		C.	2d.	To join at Trichinopoly,
17th "	" A. P. Bainbridge					Will proceed in Command of the Detachment of Artillery under orders to march from the Mount to Trichinopoly.
29th "	Capt. J. H. Elwyn.....					Directed to proceed to join his Battery at Cannanore.

## LEAVE OF ABSENCE IN INDIA.

1861.	<i>Names</i>	<i>Where and Remarks.</i>
22d Aug.	Colonel J. Maitland, Supt. Gun Carriage Manufactory.	For fifteen days in extension of that granted in the Fort St. George Gazette of the 30th July 1861.
29th "	Captain W. J. Bradford, (A. D. C. to Major Genl. Bradford)	For one month from date of departure from Meerut, on urgent private affairs, preparatory to applying for permission to proceed to England.



## LEAVE OF ABSENCE IN EUROPE.

1861.	<i>Names.</i>	<i>Remarks.</i>
6th Aug.	Captain W. J. Bradford,—	For 2 years, under the new regulations, and to embark from Calcutta.

## EXAMINED IN THE HINDOOSTANEE LANGUAGE.

1861.

20th Aug.	Lieutenant C. J. McMahon,	} Creditable progress.
	„ K. J. L. Mackenzie,	
	„ W. Freeth,	

The Moonshes allowance to be disbursed to Lieutenants McMahon, Mackenzie, and Freeth.

## CONTINGENT GUN ALLOWANCE.

*G. O. G. No. 292, 30th August 1861.*—The Governor in Council directs that the following correction be made in the Statement published in *G. O. G. No. 111*, dated 26th March 1861, exhibiting the names of Officers specially entitled, under the orders of the Supreme Government, to share in the Contingent Gun Allowance, under the rules of the Bengal Presidency.

*D. Company 3rd Battalion Artillery*

Strike out the following:—

R. A. P.

Captain A. C. Jones, from 16th November 1857, to 19th October 1858, 333 days.....	1,070	13	4
Captain C. H. Hutchinson, from 20th October to 19th November 1858, 31 days.....	98	3	4

Substitute the following:—

Captain C. H. Hutchinson, from 16th November 1857 to 19th November 1858, 369 days.....	1,169	0	8
--	-------	---	---

CLOTHING TO BE ISSUED ON 1<sup>ST</sup> APRIL INSTEAD OF ON THE 1<sup>ST</sup> JANUARY IN EACH YEAR.

*G. O. G. No. 295, 3rd September 1861.*—The following General Order by His Excellency the Governor General of India in Council is republished :

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 15th August 1861.*

No. 712 of 1861.—In order that Clothing to the whole Army may be simultaneously issued, and in conformity with the rule as to the date of issue of Clothing to the British Troops, the Right Hon'ble the Governor General in Council is pleased to direct that in future, Clothing for the Army in India, European and Native, in the three Presidencies, shall be issued on the 1st April, instead of on the 1st January in each year.

Compensation, in lieu of Clothing, will be granted for the three months from 1st January to the 31st March 1862.

SOLDIERS ELECTING FOR GENERAL SERVICE, THEIR WIDOWS ENTITLED TO THE BENEFITS OF LORD CLIVE'S FUND, AND MODE OF DEALING WITH ESTATES OF OFFICERS AND MEN TRANSFERRED TO GENERAL SERVICE.

*G. O. G. No. 299, 6th September 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 16th August 1861.*

No. 718 of 1861.—The following paragraphs of a Military Letter from the Right Hon'ble the Secretary of State for India, No. 284 of the 16th July 1861, are published for general information:—

1. I have considered in Council your Lordship's Military Despatches No. 63, dated 3rd May 1861, and 18th May, No. 77, requiring early instructions in regard to the admission, to the benefits of Lord Clive's Fund, of the widows of Soldiers who may die after having volunteered from the Local Service to the Royal Artillery or to one of the new

Line Regiments; and secondly, with regard to the mode of dealing with the Estates of deceased Officers and men, who, having now entered Her Majesty's General Service, may die in India.

2. With reference to the first question I observe that, in the 6th Clause of your General Order No. 332 of the 10th April, and in the 13th Clause of the General Order of the Governor General of the same date, Soldiers volunteering for General Service have the option of choosing whether their future Pension shall be reckoned according to the Regulations of Her Majesty's Army, or according to those of the Indian Forces. I am of opinion that the Soldiers electing the latter alternative are entitled to all benefits for themselves or their families claimable under the Indian Regulations, including those of Lord Clive's Fund. I am also of opinion that under a liberal construction of Clauses 65 of the General Order, and of the paragraphs of my despatches (paragraph 12 of No. 27, and paragraph 14 of 28,) on which it was founded, the Officers of Her Majesty's Indian Forces electing General Service do not forfeit for themselves or their families the benefits which they would have derived in the Local Service from Lord Clive's Fund.

3. The method of dealing with the Estates of deceased Officers and Men who have been transferred from Local to General Service must be arranged in communication with Her Majesty's Secretary of State for War, to whom a reference has been made. The results will be communicated to you hereafter; but, in the meantime, the existing practice may be continued.

4. I would observe, however, with reference to a remark in the 7th paragraph of your Despatch of the 3rd May, that it was never intended that Paymasters should not be appointed to the new Line Regiments, that these Regiments should be deficient in any thing that may be essential to the

complete assimilation of their organization and internal economy with those of other Regiments of the Line.

(Signed) R. J. H. BIRCH, Major General,  
*Secy. to the Govt. of India.*

II. The attention of Officers Commanding, is directed to the instructions contained in para. 3 of the foregoing Order.

**RÉGULATIONS FOR RE-ENGAGEMENT OF LIMITED SERVICE MEN.**

*G. O. C. C. No. 78, 13th September 1861.*—The Provincial Commander in Chief directs it to be notified for general information that limited Service men whose first term of service has expired and who have volunteered for General Service and been transferred, are to be engaged under Act 10 and 11 Vic. Cap. 37, but their re-engagement should be regulated by the 54th Section of the Mutiny Act for 1861, which now applies to all Soldiers of Her Majesty's British Forces.

2. Claims to Bounty are to be submitted to the Pay Department supported by an *Authenticated Copy* of the attestation on enlistment, or of the Declaration on re-enlistment, made by the Soldier as laid down in the Mutiny Act for 1861.

**REGULATIONS REGARDING OFFICERS ELECTING FOR THE STAFF CORPS.**

*G. O., G. No. 319, 17th September 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished:—

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William the 5th September 1861.*

No. 784 of 1861.—The following paragraphs of a Military Letter from the Right Hon'ble the Secretary of State for

India, No. 302 of the 2nd August 1861, are published for general information:—

1. The Royal Warrant establishing the Staff Corps for India permits Officers now in Staff employment, who may join the Corps on its formation, to count their previous Staff service towards promotion to the extent specified in the 3rd Clause of the Warrant.

2. Many Officers, on joining the Corps, will be entitled to a step of substantive rank under this provision.

3. Unless it be carefully guarded against, Officers entitled, by length of service, to the full pay pension may volunteer for the Staff Corps with the view of obtaining the step of rank, and then immediately retire from the Service.

4. That this is likely to occur is proved by an enquiry recently made by an Officer on Furlough. This Officer, a Regimental Captain, asks whether he can join the Staff Corps, receive the promised step of substantive rank, thus becoming a Major, and then retire from the Service with the Honorary rank of Lieutenant-Colonel.

5. He has been informed that Officers intending to retire from the Service immediately, will not be permitted to join the Corps for the purpose of gaining a step of substantive rank.

6. Previous Staff Service is allowed to reckon for promotion under the Warrant, and the step of rank is conceded for the purpose of inducing experienced Staff Officers to join the Staff Corps, and thus securing the continuance of their services. But it would be quite inconsistent with this object, and would be a gross abuse of the privilege thus conceded, if Officers were permitted to join the Corps with the object of obtaining a step of rank by their transfer to it, and then quitting the Service.

7. This cannot be allowed, and it should be made known that no Officer will be permitted to join the Staff Corps for

the purpose of obtaining a step of substantive rank and then retiring immediately.

8. Cases may nevertheless occur, and whenever it shall clearly appear that this has been done intentionally, I desire that each case be reported for my decision, and, under any circumstances, I shall decline to recommend the grant of the step of Honorary rank to which the Officer might otherwise have been eligible.

**RATES OF PASSAGE MONEY TO ENGLAND FOR TIME EXPIRED MEN, PENSIONERS, WIVES OF SOLDIERS AND SOLDIERS' WIDOWS.**

*G. O. G. No. 324, 20th September 1861.*—The Governor in Council is pleased to notify that Time expired Men and Pensioners of H. M.'s British and Indian Forces, and their Wives, entitled to passage to England, will, when making their own arrangements for proceeding thither, be granted £12 as passage money, at the current rate of exchange.

2. The Wives of Invalid Soldiers proceeding to England, or of effective Soldiers, whose Regiment is under orders to return thither, will also receive the allowance above authorized, when permitted by the proper Department under the Commander in Chief to return to Europe in private employ, preceding or following their husbands. In the latter case, the passage money will be issued on condition that the parties concerned embark within three months after the embarkation of their husbands.

3. Passage money at the abovementioned rate will likewise be granted to Soldiers' Widows returning to Europe in private employ, provided they embark within six months after the death of their husbands.

**SCALE OF SERVICE AND PENSION OF OFFICERS OF THE INDIAN FORCES WHO JOIN THE STAFF CORPS.**

*G. O. G. No. 330, 27th September 1861.*—The following General Order by His Excellency the Governor General of India in Council, is republished:—

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

Fort William, the 10th September 1861.

No. 799 of 1861.—The following paragraphs of a Military Letter from the Right Hon'ble the Secretary of State for India, No. 296, dated 25th July 1861, are published for General information :—

1. In your letter dated 18th May 1861, No. 78, you raise the question whether Officers of the Indian Forces who join the Staff Corps and obtain promotion therein will be entitled to the benefit of the Retiring Regulations of 1796 as well as those of 1836-37. In other words whether such Officers will retain their right to retire on the pension of the substantive rank they may hold, provided they have completed twenty-

* Service in India	Pension.		
	£.	s.	d.
20 years as Captain.....	191	12	6
24 " " .....	292	0	0
28 " " .....	365	0	0
32 " " .....	456	6	0

two years' actual service, should that be more advantageous to them than the scale\* of pension fixed by the Royal Warrant of the 16th January last.

2. The scale of service and pension fixed in the Royal Warrant, which is the Indian scale of pensions under the Regulations of 1836, based on the principle of length of service, is to be applicable to both British and Indian Officers, with the *proviso*, as regards British Officers, that not less than half the required period of service shall have been passed in the Staff Corps.

3. Officers of the Indian Army, however, who may, at the time of joining the Staff Corps, have acquired, under the Regulations of 1796, the right of retiring on the pension of the rank, which they then hold, whenever they may subsequently retire; but they are not to be allowed to retire on a pension according to rank under the above Regulations in respect of any rank subsequently acquired under the rules of promotion of the Staff Corps.

4. The right of retiring on the pension of the rank they hold at the date of joining the Staff Corps will preserve to local Officers who have been fortunate in their promotion the benefit of the rate of pension they may have acquired by their previous service in the Army.

5. For instance, an Officer on joining the Staff Corps, who has attained the rank of Lieutenant-Colonel after twenty-two years' service, will retain his right at any time during his subsequent service to retire on the pension of that rank. Were he confined to the Staff Corps scale of retirement, he would be required to serve for a period of six years in that Corps before he could be entitled to retire on the pension of a Lieutenant-Colonel.

6. On the other hand, it cannot be conceded that Officers shall be entitled to claim the pension according to rank, in respect of rank obtained in Staff Corps. Many Officers on joining the Staff Corps will obtain an immediate step of rank, and some a second step after a short period of service. An Officer, for instance, of the rank of Captain, entitled to count previous service (Army and Staff) for promotion, might join the Staff Corps for one day, and then, if he were allowed to retire under the Rule of 1796, he would retire on the pension of a Major. Or, if his previous service were sufficient, he might after two years' service in the Staff Corps, gain two steps of rank and then retire with the pension of a Lieutenant-Colonel. This would give him an undue advantage, which was not intended, and cannot be allowed.

7. As connected with this subject, I have to inform you that in reply to an inquiry addressed to me by an Officer in this country, who had elected the Old Furlough Regulations, I have stated that his service for pension should reckon under the Old Rules until he joined the Staff Corps, but that, after that date, he would be under the operation of the New Furlough Rules as laid down in the General Orders, 10th April 1861, (93.)



8. This will secure to all Officers their privileges with respect to Furlough, according to the election they had previously made to the date of their joining this Corps.

9. This decision will be duly acted upon by your Government.

*A. O. 2nd September 1861.*—I. The following is published for general information and guidance.

No 3554.

To,

*The Brigadier Commandant of Artillery.*

SIR,

In returning Certificates for Bounty *due before 10th April 1861* to men of limited and unlimited service of the Regiment of Artillery, I have the honor, by order of the Provincial Commander in Chief, to inform you that, under orders from Government, these certificates have been passed; but certificates for any men of limited or unlimited service whose Bounties became due *on and after the above date* cannot be passed.

2. Such of the men of limited service as have volunteered for "*General service*" under G. O. G. G. 10th April 1861 No. 332, (and whose Certificates are enclosed,) are not required to go through the form of making a Declaration, but their acquittance is to be taken for the amount.

3. I am also instructed to inform you that claim to Bounty *due before* the 10th of April 1861, is not invalidated by a soldier having elected for "*Local*" service under the provisions of the G. O. G. G. above quoted. Ten forms of Declaration are enclosed, to be executed by men who may have so elected.

*A. O. No. 15, 16th September 1861.*—I. Several instances having lately occurred of Officers addressing the Adjutant General of the Army, through Artillery Head Quarters, on

subjects not expressly sanctioned by the General Regulations of the Army, the Commandant deems it requisite to publish the following extract from Circular Memorandum from the Adjutant General of the Army, under date 29th March 1836, and to state that he desires the principles therein enjoined for guidance, may be observed by Officers of the Corps in their communication with Army Head Quarters.

“ The Commander in Chief would also take this opportunity of remarking upon the erroneous system which now generally obtains in the several Divisions of the Army, in respect to the transmission of references and appeals from Regiments to Head Quarters, upon matters distinctly within the control of the Division General or Brigadier— If a dispute, or irregularity of any kind, occurs in a Regiment, which the Officer at its head finds himself unable to dispose of, immediately a letter is addressed to the *Adjutant General of the Army* reporting the circumstance for the information of the Commander in Chief, altogether passing over the Officers in intermediate command, who, nevertheless, forward it on with their countersignatures, and thus virtually sanction the supersession of their own authority. The Commander in Chief is, in consequence, continually occupied with matters which ought to be disposed of by Brigadiers or Generals of Division. The plain principles of discipline in every well ordered Regiment establish a regular gradation of responsibility from the lowest to the highest rank, and the same principles are equally necessary to be observed in continuing the succession of responsibility from the Regimental Commanding Officer to the Commander in Chief, references and appeals being made, first to the Brigadier; then, if necessary, by the Brigadier to the General of Division; who alone is to decide upon the necessity of submitting the subject to Head Quarters—The Commander in Chief desires that, in future, this course may be pursued on all such occasions as are now referred to.”

*A. O. No. 16, 28th September 1861.—I.* When Officers refer, in correspondence, to any General Order, the page, as well as No. and date thereof, is invariably to be mentioned.

*A. O. No. 17, 28th September 1861—II.* The following is published for general information:

3902.

To,

*The Brigadier Commandant of Artillery.*

SIR,

I have the honor, by order of the Provincial Commander in Chief, to communicate to you the following replies, by the Government of India, to Questions on the Amalgamation Order, which it has not been considered necessary to publish in General Orders.

2. Copies of papers shewing what has been done with reference to the East Indians in the Lahore Light Horse, referred to in answer 1, are appended for information and guidance.

*Questions.*

1. Is it intended that the Warrant and Non-Commissioned Officers of the Madras Gun Carriage Manufactory and men of the Ordnance Artificer Company, and also East Indian Drivers, who are all attested Soldiers, should be called upon to say whether they will volunteer for General Service?

2. Are Half-Pay Drummers and Buglers of Infantry and Artillery to be called upon to declare whether they will volunteer for General Service? If so, what Bounty is to be offered them?

*Answer.*

1. The men first named are on the same footing as the men of the Ordnance Artificer Company, to which they originally belonged. The men of the Ordnance Artificer Company are not considered eligible to volunteer. The East Indian Drivers are on the footing of the Lahore Light Horse.

2. On attaining the age of eighteen they will be called on to volunteer, and will receive full Bounty—if they have received half Bounty, it is not to be retrenched; and, on attaining the age of eighteen, they will receive the other half on volunteering. To those who have received half Bounty, no further option as to volunteering will be given on attaining the age of eighteen.

7. A limited service soldier was re-attested to serve for 12 years on the 10th March, receiving the usual Bounty. He now volunteers for general service. How is this case to be dealt with? What is the rate of Bounty payable to him under paragraph 20?

9. Are the following appointments to be considered as coming within the provisions of paragraphs 26 and 45 of the Amalgamation order?

Examiner Ordnance Department.  
Auditor of Public Works Accounts.

Consulting Engineer of Railways.  
Deputy do. do. do.  
Mint Master.

10. Are Colonels of Artillery under the new organization, not being Colonels Commandant, permitted, if out of employ, to elect India as their place of residence, instead of going to Europe? And in the event of such permission, will they draw the Indian Pay and allowances fixed for the Rank of Regimental Colonel, "Colonel's allowance" excepted?

22. An Artillery Officer, on Staff employ for twenty-two years, went to England on sick leave in March 1859; returned to India on 24th October 1860; and, on the 12th November, was nominated as temporary additional Commissioner for Nagpore, a freshly created appointment. Is he entitled to join the Staff Corps?

23. Would his joining the Staff Corps exclude him from any consideration that may be extended to the Artillery in way of grant of Bonus, extra pension, or other equivalent in lieu of that proposed for the other branches of the service, or which he would, under the old state of affairs, have received from the Regimental Retiring Fund?

24. Will his consenting to serve out of India, if required; or, in

7. The highest rate of Bounty, 50 Rupees, notwithstanding his having received Bounty on the 10th March.

9. These appointments cannot come under paragraph 26th, but they do come under paragraph 45.

10. Yes to the whole question.

22. He is eligible under the conditions of paragraph 73 of the General Order.

23. His joining the Staff Corps would not exclude him from the benefits of extra Pension; but as to bonus and the Artillery Retiring Fund, that is a matter of Regimental arrangement.

24. His being willing to serve out of India will not make any

other words, agreeing to General service; militate against his retention of staff appointment, which he is otherwise allowed to retain without joining Staff Corps?

25. If he consents, as above, to serve out of India when ordered, will such service count year for year, or only two years as one for pension?

26. Suppose he elects for local service, shall he, an Artillery Officer, be in consequence thereof placed at disadvantages, as compared with those who have given in their names for general service, in the way of command and duties in India?

change, but if he is permitted to do so, his staff appointment here will, of course, terminate.

25. It is distinctly laid down that Officers ordered to serve out of India with their Regiments, will be allowed to count such service year for year. If an Officer is ordered, he has no option in the matter.

26. The question is too vague to admit of an answer.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE,  
FORT SAINT GEORGE,  
20th September 1861.

(Signed) C. COOKE, Lieut.-Colonel.  
Deputy Adjutant General of the Army.

*From the Adjutant General of the Army, Head Quarters  
Calcutta, 26th April 1861, No.  $\frac{402\frac{1}{2}}{A}$ ; to the Secretary to  
the Government of India, Military Department.*

I have the honor to forward copy of letter No. 97, of the 25th instant, from Lieutenant O. Barnes Commanding Lahore Light Horse, in which some important questions are raised by him as to the volunteering of the men of his Corps, transferred from old Native Regiments, with receipt of Bounty, under the operation of paragraph 21 of the Government General Order of the 10th instant.

2. Lieutenant Barnes represents that there are two classes of men in the Lahore Light Horse, one regularly attested,

and the other composed of men transferred from old Native Regiments ; and with regard to the latter class he enquires, would they, in case of volunteering, be compelled to enlist ? And if so, for what term of years ? And what Bounty will they receive ?

3. In reply to the first of these questions, it appears to the Commander in Chief that these men were enlisted on the footing of Natives for unlimited service, and can claim\* discharge at any time after three years, unless their Troop or Company is ten per cent below its proper complement. These men are, therefore, on a totally different footing, as regards their conditions of service, from the other class, who have been enlisted under the Limited Service Act ; and it therefore appears to His Excellency that there would be great difficulty in treating them as to the Bounty on volunteering in the same manner as the regularly enlisted and attested European soldier.

\* Art. 2, Section 27, part 2, of the Military Regulations.

They possess in fact superior privileges, in not being bound to the service, except under a certain contingency, beyond a period of three years ; and the Commander in Chief is therefore of opinion that they have no just claim to receive Bounty on the same footing as the other class.

4. The difficulty to be met is this ;—that the 21st paragraph of the Government General Order referred to, declares “ the immediate issue of Bounty to men volunteering is hereby authorized, on their making the Declaration appended to this General Order before a Justice of the Peace or Magistrate ;” but the form of the Declaration is inapplicable to any but those soldiers who have enlisted for a limited term of service.

It appears to His Excellency that the difficulty might be met in the following manner ;—that this class of men should

receive, all of them, a fixed rate of Bounty in accordance with the scale laid down in the General Order, namely,

	Rs.	As.	Pice
To men who have more than two, and less than three, years to serve, to complete the term of service entitling them to claim discharge.....	30	0	0
To men who have more than one, and less than two years to run.....	20	0	0
To men who have one year, or less, to run...	10	0	0

5. As regards the other questions put by Lieutenant Barnes relating to Pension of this class of men, the Commander in Chief observes that, under present Regulations, they are not entitled to any, except Invaliding Pension, under the rules applicable to Native soldiers. But if it be deemed expedient to assimilate the conditions of service of both the classes now serving in the Lahore Light Horse, the Pension Regulations applicable to the European Forces must be extended to the Eurasian transfers from the Native Army.

*From the Secretary to the Government of India, Military Department, Fort William 27th April 1861, No. 1171 ; to the Adjutant General of the Army.*

In reply to your letter dated 26th instant, I am directed to acquaint you, for the information of His Excellency the Commander in Chief, that the Right Honorable the Governor General in Council is pleased to approve of the suggestions made by His Excellency, respecting the rates of Bounty to be granted to such men of the Lahore Light Horse as were transferred to it from old Native Regiments, who may desire to volunteer to Line Regiments, under the provisions of the General Order of the 10th instant.

2. The Pension Regulations applicable to the European Forces of the Line, will be equally applicable to these men, as to other volunteers into the Line Regiments.

*From the Adjutant General of the Army, Head Quarters Calcutta, 8th May 1861, No. 644; to the Secretary to the Government of India, Military Department.*

For the information of Government, I have the honor to report that, with advertence to the decision passed in Council in regard to the extension of the General Order by the Governor General No. 332 of 10th ultimo to the Lahore Light Horse, to the effect stated in the annexed copy of a memorandum forwarded to me by the Commander-in-Chief, the Officer Commanding this Regiment has been instructed to allow the unenlisted (Eurasian) portion of the Corps to volunteer with Bounty, on the condition of their enlisting for the Lahore Light Horse for the prescribed Cavalry term of twelve years, and being attested for Her Majesty's General Service.

2. A Form of the Attestation paper to be used, and altered to suit the case, is sent herewith for information.

*Memorandum of His Excellency the Commander-in-Chief cited in the letter.*

Are allowed to enlist in Lahore Light Cavalry as Recruits, for the prescribed term of service receiving the usual Bounty.

The 3rd May 1861.

(Signed) H. ROSE.

*From the Assistant Secretary to the Government of India, Military Department, Fort William 17th May 1861, No. 816; to the Adjutant General of the Army.*

I am directed to acknowledge the receipt of your letter No. 644 dated the 8th instant, reporting that the Officer Commanding the Lahore Light Horse has been instructed to allow the unenlisted (Eurasian) portion of the Corps to volunteer, with Bounty, on the condition of their enlisting for that Regiment, and to state that the same has been duly laid before Government.

(A true copy.)

(Signed) C. COOKE, Lieut.-Colonel,  
*Deputy Adjutant General of the Army.*



*A. O. 30th September 1861.*—II. The following is published for general information.

No. 4093.

To,

*The Brigadier Commandant of Artillery.*

ORDER NO. 3359.

Ordered to be referred to the Government of India for early consideration and orders.

Meanwhile, should the drafts in question arrive before a decision is received, the Governor in Council directs that they, as also the men of the Indian Artillery who have volunteered for General Service and may be formed into the new Brigades and Batteries, be paid at the daily rates of the Royal Artillery, pending the receipt of instructions from the Government of India.

SIR,

In acknowledging the receipt of your letter of the 7th September 1861 No. 905, I am instructed to annex in the margin the decision of Government, under date the 20th September 1861, on the subject of the communication now under acknowledgment.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE,  
FORT SAINT GEORGE,  
28th September 1861.

(Signed) C. COOKE, Lieut.-Colonel.  
*Deputy Adjutant General of the Army.*

#### ARRIVALS.

1861	Names.	From.	To.
5th Sept.	Lieut. M. L. Monckton,	Rangoon.	St. Thomas' Mount.
5th "	" A. Wynch,		
5th "	Lt. Col. H. C. Wade,	"	Madras.
28th "	Lieut. F. S. Budd,	Europe.	"
30th "	Captain W. C. L. Baker,	Ootacamund	"

#### DEPARTURES.

1861	Names.	From.	To.
9th Sept.	Lieut. J. G. Marshall,	St Thomas' Mount.	Cannanore.
9th "	Captain J. H. Elwyn,	do.	do.
10th "	" B. C. Hitchins,	Madras.	Penang.

#### PROMOTIONS AND APPOINTMENTS.

1861	Names.	To.
20th Sept.	Captain E. T. Fasken,—	To be hereafter designated " <i>Examiner Ordnance Department</i> " only.
24th "	2d Capt. F. L. Playfair,	Appointed to the Madras Staff Corps.
	Assistant Resident Malacca.	

## REMOVALS AND POSTINGS.

Date.	Rank and Names.	From.		To.		Remarks.
		Troop or Company.	Brigade or Battalion.	Troop or Company.	Brigade or Battalion.	
1861 6th Sept.	A. Company. 5th Battn. Artillery. D. Company 5th Battn. Artillery.	Singapore.		Mangalore.		
	A. Comp. Gun Lascars	Mangalore.		Singapore.		
	B. " "	Thyetymyo Straits.		Trichinopoly Cannanore.		
	C. " "	Trichinopoly Cannanore.		Thyetymyo Straits.		
17th "	Capt. C. A. Purvis.....	A.	5th	D.	5th	To join on the arrival of the D. Company 5th Battalion in the Straits, (now Commanding Artillery in the Straits.) To do duty under the Orders of the Officer Commanding Madras Artillery in Mysore, until further orders. Now at the Mount, to join at Bangalore. To have effect from date of Captain Forster's joining at Bangalore.
	2d Capt. J. M. Macintyre 3d Battalion.	B.				
	2d Capt. W. D. Forster...	D.	1st	E.	3d	
	" P. St. G. Grème	D.	5th	A.	5th	

## LEAVE OF ABSENCE IN INDIA.

1861	Names.	Where and Remarks.
17th Sept.	Lieut. Col. H. C. Wade, Comy. of Ord. Rangoon.	Presidency, S. C., from date of departure, to obtain a final medical certificate to proceed to Europe.

## LEAVE OF ABSENCE IN EUROPE.

1861	Names.	Remarks.
27th Sept.	Lieut. Col. H. C. Wade, Comy. of Ord. Rangoon.	On medical Certificate for 18 months, under the Regulations of 1854, and to embark from Madras.

## RETIREMENTS.

Extract from G. O. G. No. 326, dated 20th September 1861.

" The undermentioned Officers are permitted to retire  
" from the Service."

" Lieutenant Colonel (Brevet Colonel) W. M. Gabbet  
" of the Artillery, on the pension of a Lieutenant Colonel,

“ with the addition of £ 50 per annum, granted by G. O. G. No. 79, dated 8th March 1861, from the date of departure of the last Steamer for Suez in this month.”

“ Lieutenant Colonel John Babington of the Artillery, on the 28th September 1861, on the pension of a Lieutenant Colonel, with the addition of £ 50 per annum, granted by G. O. G. No. 79, dated 8th March 1861.

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SERVICES OF LIEUT. COLONEL (BREVET COLONEL)  
W. M. GABBETT.

Lieutenant Colonel W. M. Gabbett was a Cadet of 1828 and arrived in India 10th August 1829.—Date of Commission as 2nd Lieutenant 12th December 1828; as 1st Lieutenant 4th June 1836; as Captain in the Army 12th December 1843; as Captain in the Regiment 30th April 1849; as Major in the Army 1st May 1849; as Lieut. Colonel in the Army 28th November 1854; as Colonel in the Army 28th November 1857, and as Lieut. Colonel in the Regiment 18th February 1861.

Was Acting Quarter Master and Interpreter 5th Battalion Artillery from 21st December 1835 to 17th March 1836.—Acting Adjutant E. Troop Horse Brigade from 12th July to 1st August 1839.

Served with the Expedition against Kurnool in 1839 and was present at the battle of Zorapore 18th September 1839.

Was Aide-de-Camp to Sir H. Gough, K. C. B. Commanding Madras Army from 31st December 1839 to 31st March 1840.

Served with the Expedition to China in 1840, 1841 and 1842; Was present at the capture of Chusan 5th July 1840, and Storming of the heights and Forts before Canton on the 25th May 1841;—His conduct was noticed in G. O. G. 1st May 1841 and G. O. G. 20th August 1841.

Was present at the taking of Amoy 25th August 1841:—Second Capture of Chusan 1st October 1841; Capture of

Chinhae 10th October 1841, and Capture of Ningpo 13th October 1841;—After the capture of Ningpo, Colonel Gabbett (then 1st Lieutenant) was deputed to carry despatches to the Governor General of India—in one from Lieutenant General Sir H. Gough, G. C. B. Commanding Military Branch Expedition dated 18th October 1841, he was noticed as follows.

“ This despatch, together with plans of Amoy, Chusan and Chinhae will be delivered by Lieutenant Gabbett, of the Madras Artillery, my Aide-de Camp, whom I beg to recommend to your Lordship, and who will be able to afford any further information you may require.”

Was present at the capture of Chappoo 18th May 1842; Woosung 16th June 1842, and Shanghae 19th June 1842.—Storming of Ching-Keang-foo 21st July 1842 and operations before Nankin in August 1842.

Was Aide-de-Camp to Sir H. Gough, K. C. B. Commanding the Forces in China from 2nd June 1841 to April 1843.

Commanded the Artillery in the Ceded Districts from 25th February 1847 to 21st February 1848.

Was Aide-de-Camp to Viscount Gough, G. C. B. Commander in Chief in India from 21st March 1848 to 7th May 1849.

Served in the Campaign in the Punjaub in 1848 and 1849.

Was present at the Battle of Ramnugger 3rd December 1848; Battle of Chillianwallah 13th January 1849, and Battle of Goojerat 21st February 1849.—Was present with the Force under Sir W. Gilbert, G. C. B. in pursuit of the Affghans to Peshawar and Jamrood in March 1849.

Was noticed in G. O. G. 12th February 1849 and G. O. G. 21st March 1849.

Commanded C. Company 1st Battalion from 2nd April to 6th December 1850; D. Company 2nd Battalion from 27th

December 1850 to 5th August 1851, and A. Company 1st Battalion from 28th November 1851 to 15th July 1852.

Was Inspecting Officer of Ordnance on the works and Commanding Artillery in Fort Saint George from 31st August 1852 to 6th June 1856.—Acting Superintendent Gunpowder Manufactory from 11th January 1854 to 6th April 1854,—from 7th May to 16th May 1854, from 24th June 1854 to 10th September 1855, and again in April 1856 during the absence of Colonel Anstruther on privilege leave.—Acting Commissary of Ordnance Fort St. George from 8th January to 1st April 1856.—Commissary of Ordnance Trichinopoly from 6th June 1856 to 5th April 1859.

Was the 8th Lieutenant Colonel on his retirement from the Service, 28th September 1861.

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SERVICES OF LIEUTENANT COLONEL J. BABINGTON.

Lieutenant Colonel J. Babington was a Cadet of 1828, and arrived in India 20th December 1829—Date of Commission as 2d Lieutenant 12th June 1829; as 1st Lieutenant 12th September 1837; as Captain in the Army 12th June 1844; as Captain in the Regiment 7th October 1849; as Major in the Army 28th November 1854, and as Lieutenant Colonel in the Regiment 18th February 1861.

Was Acting Adjutant of the Saugor Artillery Division from 11th November 1848 to 7th February 1849, and from 1st February to 23rd April 1850.—Commanded Artillery Saugor Division from 10th November 1850 to 17th January 1851.—Commanded Artillery Northern Division from 23rd June 1852 to 1st July 1854.—Commanded Artillery Pegu Division from 14th October 1857 to 23rd December 1857, and from 30th July to 11th November 1860, and again from 15th January to 9th February 1861.

Was the 9th Lieutenant Colonel on his retirement from the Service, 28th September 1861.

RULES REGARDING PAY AND PROMOTION, OF OFFICERS  
OF THE INDIAN ARTILLERY REGIMENTS, PERMITTED  
TO SERVE OUT OF INDIA.

*G. O. G. No. 334, 1st October. 1861.*—The following General Order by His Excellency the Governor General of India in Council, is re-published.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 12th September 1861.*

No. 806 of 1861.—The following paragraphs of a Military Letter from the Right Hon'ble the Secretary of State for India, No. 297 of the 25th July 1861, are published for General information:—

1. The 30th Clause of your General Order, No. 332 of the 10th April, lays down generally the Rule regarding pay and promotion of Officers of the Indian Artillery Regiments “who are willing to serve out of India, and may be permitted to do so.”

2. It has now become necessary to determine more specifically the conditions under which Officers of Artillery and Engineers may be permitted to avail themselves of the option of general Service.

3. It must be clearly understood, in the first place, that India has the first claim to the services of all the Officers who have entered the Indian Armies, and that no Officer can be available for employment out of India (except during Furlough) unless the Government of the Presidency to which he belongs is willing to dispense with his services; and further, that it will rest with His Royal Highness the General Commanding-in-Chief to give or not to give employment to Officers volunteering for general service out of India, whose services are placed at his disposal by the Secretary of State, on the recommendation of the Indian Government.

4. Of the Officers of Artillery, it is not improbable that a proportion may be available for this service without public inconvenience. Their organization into fourteen Brigades provides in each Presidency a surplus of Officers above the complement of the Batteries which it is at present intended to maintain for duty with Irregular Native Artillery and for other detached employment; and, irrespective of the Officers who may possibly be spared without detriment to the public interests for service out of India, there would be no objection to permit Artillery Officers of the late Indian Army, who may wish for service out of India, to exchange with Artillery Officers of corresponding rank serving elsewhere, provided that the services of Officers with Indian experience can be spared in that country; but of course no such arrangement can take effect without the formal consent of the General Commanding-in-Chief of the British Army, of the Secretary of State for India, and of the Government of the Presidency to which the Indian Officer wishing to exchange may belong.

5. In such cases, the Officer of Royal Artillery undertaking service in India will be on the same footing as all other Officers of the Royal Artillery serving in that country.

6. The Indian Officer exchanging for service out of India will be on the same footing as Officers of Royal Artillery serving out of India, except that he will be permitted to reckon for retiring Pension under the Indian Regulations only half the time of his employment out of India. His position with respect to the Military and Orphan Funds of his Presidency will be governed by the rules of those Institutions respectively. His promotion will go on in the list of the Regiment of late Indian Artillery to which he may have belonged.

7. In accordance with the usual practice in all similar cases, the Officers so exchanging will not be entitled to passage money at the public charge.

8. Exchanges will be permitted, on terms and conditions similar to those above described, between Officers of the Royal and late Indian Engineer Corps; but, in accordance with the provisions of the 42nd paragraph of your General Order, the Officers of Royal Engineers undertaking service in India must be prepared to perform the several duties required from Engineer Officers in the Public Works Department, and will be subject in all respects to the rules of that Department for the time being.

9. Officers of Artillery and Engineers of the former Indian Service wishing to avail themselves of the terms above described may submit their applications through their Commanding Officer, or the Heads of their Departments respectively, to the Adjutant General of the Army in India, by whom they will be forwarded, with such remarks as His Excellency the Commander-in-Chief may think proper, to the Secretary to Government in the Military Department, and it will rest with the Local Government to transmit the names of such Officers from time to time for the information of the Secretary of State for India.

10. The sanction of the Government of India having been obtained, it will rest with Officers of the late Indian Regiments to make arrangements for exchange with Officers of equal rank serving in any other part of the world, and to submit their joint applications to the Adjutant General of the Forces at the Horse Guards for the approval of His Royal Highness the General Commanding-in-Chief.

**QUESTIONS CONNECTED WITH PAY AND ALLOWANCES TO BE REFERRED TO THE EXAMINERS IN THE PAY DEPARTMENT BEFORE SUBMISSION TO GOVERNMENT.**

*G. O. G. No. 340, 4th October 1861.*—Instances having occurred of questions connected with Pay and Allowances being submitted to Government without previous communication with the Pay Department, the Governor in Council directs that all such communications be, in the first instance,



referred to the Examiners in the Pay Department, by whom, if necessary, they will be forwarded to Government, for disposal, through the Controller of Military Finance.

**REGULATING BAND AND MESS SUBSCRIPTIONS OF OFFICERS APPOINTED TO THE STAFF CORPS.**

*G. O. C. C. No. 82, 7th October 1861.*—The Provincial Commander in Chief directs it to be notified that under a recent decision of Government, Officers appointed to the Staff Corps from the 18th February 1861, have no claim to a refund of their Band and Mess Fund Subscriptions from that date, but from the date of their being gazetted to the Staff Corps only, from which date all such Subscriptions will cease, except in the case of Probationers, under paragraph 82 of G. O. G. No. 151 of 1861, who will be liable to the payment of their Subscriptions until *finally* transferred to the Staff Corps. It will also be imperative on Staff Corps Officers who may be employed with Regiments, to subscribe to Mess and Band Funds as "Honorary Members," while doing duty with Corps, so long as these institutions continue to be maintained under competent authority.

**EUROPEAN SOLDIERS WHO HAVE ELECTED FOR THE ROYAL ARTILLERY MAY PURCHASE DISCHARGE UNDER PROVISIONS OF THE QUEEN'S REGULATIONS.**

*G. O. C. C. No. 83, 8th October 1861.*—Under instructions from Government the Provincial Commander in Chief directs it to be notified, that European Soldiers late of the Indian Forces who have elected either for the Royal Artillery or for General Service in the Infantry, under G. O. G. G. No. 332, of the 10th April 1861, may purchase their discharge under the provisions of the Queen's Regulations, and not at the rates prescribed by rules of the Indian Service.

**OFFICERS JOINING THE STAFF CORPS DO NOT FORFEIT FOR THEMSELVES OR THEIR FAMILIES THE BENEFITS DERIVED FROM LORD CLIVE'S FUND.**

*G. O. G. No. 360, 15th October 1861.*—The following

General Order by His Excellency the Governor General of India in Council, is re-published.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 27th September 1861.*

No, 868 of 1861.—The following paragraph of a Military Letter from the Right Hon'ble the Secretary of State for India, No. 330 of the 22nd August 1861, is published for general information :—

“ I have received and considered in Council your Despatch in this Department, dated the 15th June 1861, No. 106, reporting that you had, pending the receipt of orders on the subject, admitted the claim of Widows of Officers who join the Staff Corps to Pension from Lord Clive's Fund. I approve of this proceeding ; being of opinion that Officers of Her Majesty's Indian Forces, joining the Staff Corps, do not forfeit, for themselves or their families, the benefits which they would have derived in the Local Service from Lord Clive's Fund.”

FORMATION OF THE BENGAL, MADRAS AND BOMBAY  
REGIMENTS OF ARTILLERY INTO BRIGADES AND  
BATTERIES.

G. O. G. No. 378, 29th October 1861.—The following Geneneral Order by His Excellency the Governor General of India in Council, is re-published.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 14th Octsber 1861.*

No. 924 of 1861.—In accordance with the instructions of Her Majesty's Government, the Bengal, Madras, and Bombay Regiments of Artillery will be formed into the 2nd, 3rd, 4th, and 5th Royal Horse Brigades, and the 16th, 17, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th and 25th Brigades of Royal Artillery,

The Batteries of the new Royal Artillery Brigades will be composed of the Soldiers of the existing Troops and Companies of the Bengal, Madras, and Bombay Regiments of Artillery, who have volunteered for the Royal Artillery.

The Artillery-men who have elected for Local Service will be formed into separate Indian (European) Batteries.

The 2nd Royal Horse Brigade will be formed of 7 Troops of Bengal Horse Artillery, the 3rd Brigade of the 4 Troops of Madras Horse Artillery, the 4th Brigade of the 4 Troops of Bombay Horse Artillery, and the 5th Brigade of 6 Troops of Bengal Horse Artillery.

The Brigades of Royal Artillery will be formed—

16th of 5 Companies	of Bengal Artillery.
17th of 6	„ of Madras „
18th of 6	„ of Bombay „
19th of 5	„ of Bengal „
20th of 5	„ of Madras „
21st of 6	„ of Bombay „
22nd of 5	„ of Bengal „
23rd of 5	„ of Madras „
24th of 5	„ of Bengal „
25th of 4	„ of Bengal „

Additional Field and Garrison Batteries will be formed as soon as Artillery-men are available; and will be attached to the several Brigades in such proportions as may hereafter be determined.

The new Brigades will be constituted as follows:—

*2nd Royal Horse Brigade.*

1st Troop, 1st Brigade, Bengal Horse Artillery	will become	A Battery.
2nd ditto ditto ditto ditto		B „
3rd ditto ditto ditto ditto		C „
4th ditto ditto ditto ditto		D „
5th ditto ditto ditto ditto		E „
1st Troop, 3rd Brigade ... ..		F „
2nd ditto ditto ... ..		G „

*3rd Royal Horse Brigade.*

A Troop, Madras Horse Artillery will become	...	...	A Battery.
B ditto ditto	...	...	B "
C ditto ditto	...	...	C "
D ditto ditto	...	...	D "

*4th Royal Horse Brigade.*

1st Troop, Bombay Horse Artillery will become...	...	A Battery.
2nd ditto ditto	...	B "
3rd ditto ditto	...	C "
4th ditto ditto	...	D "

*5th Royal Horse Brigade.*

1st Troop, 2nd Brigade, Bengal Horse Artillery will become	A Battery.
2nd ditto ditto	B "
3rd ditto ditto	C "
4th ditto ditto	D "
3rd Troop, 3rd Brigade...	E "
4th Troop, 3rd Brigade	F "

*16th Brigade Royal Artillery.*

1st Company, 1st Battalion, Bengal Artillery will become	No. 1 Battery.
2nd ditto ditto ditto	" 2 "
3rd ditto ditto ditto	" 3 "
4th ditto ditto ditto	" 4 "
1st Company, 6th Battalion...	" 5 "

*17th Brigade Royal Artillery.*

A Company, 1st Battalion, Madras Artillery will become	No. 1 Battery.
B ditto ditto ditto	" 2 "
C ditto ditto ditto	" 3 "
D ditto ditto ditto	" 4 "
A Company, 4th Battalion...	" 5 "
B ditto ditto...	" 6 "

*18th Brigade Royal Artillery.*

1st Company, 1st Battalion, Bombay Artillery will become	No. 1 Battery.
2nd ditto ditto ditto	" 2 "
3rd ditto ditto ditto	" 3 "
4th ditto ditto ditto	" 4 "
1st Company, 3rd Battalion	" 5 "
2nd Company...	" 6 "

*19th Brigade Royal Artillery.*

1st Company, 2d Battalion, Bengal Artillery will become No. 1 Battery.						
2nd	ditto	ditto	ditto	...	"	2
3rd	ditto	ditto	ditto	...	"	3
4th	ditto	ditto	ditto	...	"	4
2nd Company, 6th Battalion		...	...	...	"	5

*20th Brigade Royal Artillery.*

A Company, 2nd Battalion, Madras Artillery will become No. 1 Battery.						
B	ditto	ditto	ditto	...	"	2
C	ditto	ditto	ditto	...	"	3
D	ditto	ditto	ditto	..	"	4
C Company 4th Battalion		...	...	...	"	5

*21st Brigade Royal Artillery.*

1st Company, 2d Battalion, Bombay Artillery will become No. 1 Battery.						
2nd	ditto	ditto	ditto	...	"	2
3rd	ditto	ditto	ditto	...	"	3
4th	ditto	ditto	ditto	...	"	4
3rd Company, 3rd Battalion,		...	...	...	"	5
4th	ditto	ditto	...	...	"	6

*22nd Brigade Royal Artillery.*

1st Company, 3rd Battalion, Bengal Artillery will become No. 1 Battery.						
2nd	ditto	ditto	ditto	...	"	2
3rd	ditto	ditto	ditto	...	"	3
4th	ditto	ditto	ditto	...	"	4
3rd Company, 6th Battalion		...	...	...	"	5

*23rd Brigade Royal Artillery.*

A Company, 3rd Battalion, Madras Artillery will become No. 1 Battery.						
B	ditto	ditto	ditto	...	"	2
C	ditto	ditto	ditto	...	"	3
D	ditto	ditto	ditto	...	"	4
D Company, 4th Battalion		...	...	...	"	5

*24th Brigade Royal Artillery.*

1st Company, 4th Battalion, Bengal Artillery will become No. 1 Battery.						
2nd	ditto	ditto	ditto	...	"	2
3rd	ditto	ditto	ditto	...	"	3
4th	ditto	ditto	ditto	...	"	4
4th Company, 6th Battalion		...	...	...	"	5

*25th Brigade Royal Artillery.*

1st Company, 5th Battalion, Bengal Artillery	will become No. 1 Battery.			
2nd ditto ditto ditto ... ..	2	..		
3rd ditto ditto ditto ... ..	3	..		
4th ditto ditto ditto ... ..	4	..		

All Batteries will remain at their present stations, and the Artillery-men who have elected for Indian service will continue to do duty with their former Troops and Companies, until the weather permits of their being collected and formed into separate Batteries.

The Non-Commissioned Staff who may have become supernumerary by the absorption of the 3rd Brigade, Bengal Horse Artillery, 6th Battalion Bengal Foot Artillery, 4th Battalion Madras Foot Artillery, and 3rd Battalion Bombay Foot Artillery, will be disposed of by the Commandant of the Bengal, Madras, and Bombay Regiments.

Consequent upon the foregoing formation of the Brigades and Battalions of Bengal, Madras, and Bombay Artillery into Brigades and Batteries of Royal Artillery, all Reports and Returns required by Her Majesty's Regulations will be forwarded by these Brigades and Batteries through the Commandants of Artillery at each Presidency, to the Adjutant General's Department, British Forces.

*A. O. 11th October 1861.*—II. The following is published for general information.

No. 4307.

To,

*The Brigadier Commandant of Artillery.*

SIR.

I have the honor, by order of the Provincial Commander in Chief, to subjoin the decision of Government on your letter No. 816 dated 19th August 1861.

" The Governor in Council observes that the G.\* O.  
 " appears of itself conclusive as  
 \* No. 83, 23rd March 1855. " regards the advantages to be  
 " derived by Officers who took service in the Ottoman  
 " Dominions in 1855."

" 2. Those advantages were"

" *First.* The privilege of reckoning the period of such  
 " service, as service in India counting for Pension."

and,

" *Second.* The option of returning to England on residue  
 " of furlough, after the termination of hostilities."

3. " No reason for divergence from this plain meaning  
 " of the G. O. can be found  
 No. 115 dated 28th March 1861. " in the latter G. O. refer-  
 " red to by the Brigadier Commandant of Artillery, which  
 " is applicable to Officers very differently circumstanced,  
 " who are detained in England on duty after the expiration  
 " of their leave, and have in prospective a voyage round  
 " the Cape, entailing a delay of some months in their return  
 " to India, in consequence of which they would have been  
 " deprived of the advantages of paragraph 7 of the New  
 " Furlough Regulations, had not the special order in question  
 " protected them from such a contingency."

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE, }  
 FORT SAINT GEORGE, }  
 9th October 1861. }

(Signed) C. COOKE, Lieut.-Colonel.  
 Deputy Adjutant General of the Army.

A. O. No. 19, 22nd October 1861.—I. The Commandant  
 of Artillery directs that all acquittances for Pay and Monies  
 of any kind in connection with men, Europeans or Natives,  
 of all classes, be signed by the individuals concerned in  
 presence of the Officer who certifies to the correctness of the  
 acquittance.

II. The following is published for general information.

**CIRCULAR.**

No. 4382.

To.

*Officers Commanding Divisions and Forces.*

SIR,

I have the honor, by order of the Provincial Commander in Chief, to inform you that it has been ruled by the Government of India that Unlimited Service men, who volunteered for General Service, are to sign the Declaration on volunteering.

2. They are allowed Bounty according to the length of nominal unexpired service, and the privilege of Bounty after seventeen to twenty years.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE,  
FORT SAINT GEORGE,  
12th October 1861.

(Signed) C. COOKE, Lieut.-Colonel,  
*Deputy Adjutant General of the Army.*

A. O. 25th October 1861.—I. The following Extract from a Military Despatch from the Right Honorable the Secretary of State for India, dated India Office, London, 30th August 1861, No. 149, is published for general information.

“ The undermentioned Officers have passed a course of instruction in the drill and practice of the Armstrong Field Gun, and are duly qualified to act as Instructors, namely.”

\* \* \*

“ Lieutenant C. D. A. Straker, Madras Artillery.”

III. Under instructions from Army Head Quarters, “ Recruit Boys who have attained the age of 18 years and are reported fit for the Ranks, are to be retained as Boys until the restriction to transfers is removed.”

IV. With reference to the Order of Government No. 3359, published in M. A. O. of the 30th ultimo, it is



notified that the drafts referred to arrived at Madras this day, 25th October 1861.

*A. O. No. 20, 26th October 1861.*—I. The following is published for general information.

**CIRCULAR.**

No. 4597

To,

*The Officers Commanding  
Divisions and Forces ;  
Inspector General of Ordnance and  
Magazines; and  
Commissary General.*

SIR,

I have the honor by order of the Provincial Commander in Chief, to inform you that it has been ruled by the Government of India, that unlimited service men who have elected to remain in the "Local Service," are allowed to retain their present privileges, as long as they may be fit for the service.

2. I am further to inform you that the reply to Query No. 1 in G. O. G. G. of the 9th July 1861 No. 598, published in G. O. G. dated 26th July 1861, No. 249, which states that "hence-forward no enlistment, or "re-enlistment, for the Indian Service will be legal," does not apply to unlimited service men, for they are not re-enlisted after the period when, as an indulgence, they are granted their discharge, should they wish to take it.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE,  
FORT SAINT GEORGE,  
24th October 1861.

(Signed) W. G. WOODS, Lieut.-Colonel.  
*Adjutant General of the Army*

A. O. No. 21, 31st October 1861.—I The following is published for general information and guidance.

No. 4713.

To,

*The Brigadier Commandant  
of Artillery.*

SIR,

I have the honor, by order of the Provincial Commander in Chief, to forward herewith a supply of the blank forms as per margin\* for the use of the Artillery.

\* Proceedings of Regimental Board to be held for the purpose of verifying and recording the services, conduct, character, and cause of discharge &c. of—Discharge Certificates in duplicate.

2. Every Soldier late of her Majesty's Indian Forces who has volunteered for "General Service" in Her Majesty's Army, will, when discharged, be dealt with under the Queen's Regulations of the Army.

3. In forwarding Rolls of men who apply for their free discharge, or by purchase, from the service, the present form of application may be continued.

4. A period of (30) thirty days is to be allowed to elapse from the date of the Soldier's application for his discharge, and its transmission to the Adjutant General of the Army, in order to afford the man sufficient time to reconsider the step he is about to take, and to withdraw his request if, on mature deliberation, it shall appear to him imprudent or unadvisable.

\* Blank Forms of Proceedings (with Discharge Certificates) will be forwarded from Artillery Head Quarters, on the Adjutant General's letter sanctioning the discharge of men being passed on to Officers Commanding Corps.

5. When a Soldier's discharge has been sanctioned, his claims are to be adjusted, and a Regimental Board\* will be assembled, the Proceedings of which, and the man's Discharge Certificate, (both in duplicate,) duly filled up, are to be transmitted to this Office.

6. The documents required by the Queen's Regulations to be forwarded to England by Regimental Commanding Officers, will, for the present, be forwarded by this Department to the Home Authorities.

7. Soldiers who are entitled to passage to England, and who wish to return there, will not be finally discharged until their arrival in England.

8. The claims of men who have elected for "Local Service," and who may apply for their discharge, are to be adjusted agreeably to G. O. C. C. No. 5, dated 18th January 1861, and the form of discharge Certificate heretofore in use for them will be still continued.

9. The applications now in this Office for the discharge of men who have volunteered for General Service, will be replied to immediately.

I have the honor to be &c.

ADJUTANT GENERAL'S OFFICE, }  
 FORT SAINT GEORGE, } (Signed) W. G. Woods, Lieut.-Colonel.  
 29th October 1861. } *Adjutant General of the Army.*

#### ARRIVALS.

1861	Names.	From.	At.
25th Octr.	Lieut. D. J. McGrigor,	Europe.	Madras.
29th "	" F. R. Twynam,	Bangalore.	St. Thos' Mount.

#### DEPARTURES.

1861	Names.	From.	To.
2nd Octr.	2nd Capt. W. D. Forster,	St. Thos' Mount.	Bangalore.
9th "	Lieut. W. D. Lawrell,	"	Trichinopoly.
10th "	" A. P. Bainbridge,	"	"
16th "	Lieut. Col. H. C. Wade,	Madras.	Europe.
16th "	Lieut. J. H. Gleig,		

#### PROMOTIONS AND APPOINTMENTS.

1861	Names	To.	
1st Octr.	Captain C. H. Hutchinson,	To be Lieut. } Vice Gabbett and	
"	F. G. Nuthall,	Colonels. } Babington retired;	
2d Capt.	J. M. Macintyre,	To be Cap-	
"	G. G. J. Campbell,	tains. } tains. } date of Commis-	
			sions 29th Septem-
			ber 1861.

1861.	<i>Names.</i>	<i>To.</i>
1st Octr. Supy. 2d Capt. E. W. Childers,—	Brought on the Establishment from the 29th September 1861, vice Macintyre promoted.	
	Senior Lieut R. Pope,—To be 2d Captain, vice Campbell promoted; date of Commission, 29th September 1861.	
11th Octr. 2d Capt. C. Elliot, C. B.—	Appointed to the Madras Staff Corps.	
25th „ 2d „ R. L. Playfair,—	Admitted provisionally to the Madras Staff Corps.	
25th „ Lieut. C. E. Watson.—	Admitted as a probationer in the Madras Staff Corps.	

## REMOVALS AND POSTINGS.

1861	<i>Names.</i>	<i>From.</i>	<i>To.</i>
9th Octr. Lieut. Col. A. W. Macintire, C. B.	To join the Head Quarters 4th Battalion Artillery to which he was posted in G. O. C. C. 12th June 1861.		
14th „	Capt. G. G. J. Campbell, (late promotion) C. Troop Horse Brig.		
	Lieut. M. H. C. B. Steinman	{ doing duty Horse Brigade. }	C. Troop Horse Brig.
	Capt. G. B. B. Holmes,—Appointed to do duty with the Horse Brigade during the absence in Europe of Captain A. T. Cadell, or until further orders—To join the A. Troop at Kamptee.		
28th Octr. Capt. J. De C. Sinclair	} Appointed to do duty until further orders with the A. Company 4th Battalion Artillery—to join forthwith.		
	B. Compy. 1st Battn. Arty.	}	

## LEAVE OF ABSENCE IN INDIA.

1861	<i>Names.</i>	<i>Where and Remarks.</i>
14th Octr. Lieut. J. McNeill,	} Adj. 1st Battn. Arty,	Ootacamund, from 2d October to 1st December 1861.
23rd „ Lieut. St. J. C. Shawe,	} 4th Battalion Artillery.	From 2d to 5th October 1861—to enable him to join.

## LEAVE OF ABSENCE IN EUROPE.

1861	<i>Names.</i>	<i>Remarks.</i>
1st Octr.	Capt. C. Desborough,	—Leave extended for 6 months.
	Lieut. J. C. Taylor,	„ „ „ 3 „
	„ J. H. Gleig,	—On medical certificate for 18 months, under the regulations of 1854, and to embark from Madras.
29th „	Capt. A. Stewart, Com. of Ord. Nagpore Force.	} On medical certificate for 15 months, under the furlough regu- lations of 1854, and to embark from Bombay.

## SERVICES.

1861

- 1st Octr. Lieut. Col. A. W. Macintire, C.B.—Permitted at his own request to resign his appointment of Commandant, 2d Company, Hyderabad Contingent, and his services are accordingly placed at the disposal of the Government of Fort St. George.
- 4th „ Lieut. Col. A. W. Macintire, C. B.—Services placed at the disposal of the Provincial Commander in Chief.

**SOLDIERS WHO HAVE VOLUNTEERED FOR GENERAL SERVICE TO BE PAID AT THE DAILY RATES LAID DOWN FOR BRITISH TROOPS.**

*G. O. G. No. 383, 1st. November 1861.*—The Governor in Council is pleased, under instructions from the Government of India, to direct, that, from the 1st instant, Soldiers of the Indian Royal Artillery and of the European Regiments late of H. M. Indian Army, and all men not belonging to those Corps who have volunteered for General Service, be paid at the daily rates laid down for Troops of the British Army in the Pay and Audit Regulations (Section VI) instead of at the monthly consolidated rates heretofore drawn.

**RULES REGULATING THE POWER GRANTED TO OFFICERS TO DRAW PAY AND ALLOWANCES THROUGH THEIR AGENTS WHEN ON LEAVE BEYOND THE LIMITS OF THEIR OWN PRESIDENCY.**

*G. O. G. No. 384, 1st November 1861.*—The following General order by His Excellency the Governor General of India in Council, is republished.

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William, the 18th October 1861.*

No. 941 of 1861.—The following Rules, regulating the power Granted to Officers to draw Pay and Allowances through their Agents when on leave beyond the limits of their own Presidency, are published for General information and guidance :—

I. Officers proceeding on leave beyond the limits of their own Presidencies will be permitted to draw their Pay and allowances through their Agents on the latter furnishing, through the Military Accountant to the Controller of Military Finance, a satisfactory guarantee for the refund of over-payments.

II. The Agent will not be held responsible for sums which he may have received under audit, and remitted to his constituent, except in cases where his constituent may bring himself, with retrospective effect, upon Furlough pay from the date of quitting his own Presidency by the following acts :—

1. By overstaying the leave to sea for two years on medical certificate, or for six months on private affairs, which he may have obtained under the old Furlough Rules.

2. By proceeding to England from the leave aforesaid under the old Furlough Rules, without having returned to his own Presidency.

3. By proceeding on Furlough from another Presidency, in which he had been staying on leave, without previously returning to his own Presidency.

**DUPLICATE RECEIPTS TO BE SENT TO THE SUPERINTENDENT AND AGENT ARMY CLOTHING ON TRANSFERS OF CLOTHING STORES.**

*G. O. C. C. No. 90, 5th November 1861.*—In order to facilitate the checking of transfers of Clothing Stores, the Provincial Commander in Chief directs that whenever transfers of such Stores take place in Troops, Batteries, or Companies of Artillery, and in European or Native Regiments, the Officers Commanding shall forward to the Superintendent and Agent Army Clothing, duplicate receipts thereof, retaining the original receipts for record and noting each Transfer in their Contingent Clothing Accounts, Indents, or distribution Statements, as the case may be.

**ALLOWANCE FOR PASSAGE OF THE FAMILIES OF NON-COMMISSIONED OFFICERS GRANTED FURLOUGH TO EUROPE.**

*G. O. G. No. 391, 5th November 1861.*—The following General Order by His Excellency the Governor General of India in Council, is re-published.

**GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR GENERAL OF INDIA IN COUNCIL.**

*Fort William, the 22nd October 1861.*

No. 961 of 1861.—The following paragraphs of a Military letter from the Right Hon'ble the Secretary of State for India, No. 371 of 14th September 1861, are published for general information :—

" **PARA. 6.**—A passage will be provided by the State for Non-Commissioned Officers granted furlough, but not for their wives or families, but to assist in taking Home their families an allowance of £20 is sanctioned by Government."

1. " My attention has been directed to paragraph 6 of the General Order by His Excellency the Commander-in Chief, dated the 19th April last, relative to

the grant of Furlough to Europe to deserving Non-Commissioned Officers."

2. "In order to prevent any misconception with respect to the assistance to be afforded by the State towards the passages of the wives and families of such of those Non-Commissioned Officers as are married men, I consider it desirable that it should be distinctly notified that the sum of £ (20) twenty is the total amount to be allowed for both the passage to Europe and the return voyage to India, as stated in paragraph 1 of my Despatch, No. 442 of 1860."

With reference to the foregoing, is hereby notified that the sum of £ (20) twenty is the total amount that will in any case be allowed for both the passage to Europe and the return voyage to India for the families of Non-Commissioned Officers who may be granted Furlough to Europe.

TERMS ON WHICH SOLDIERS AWARDED GOOD CONDUCT PAY MAY BE PERMITTED TO OBTAIN DISCHARGE.

*G. O. G. No. 397, 8th November 1861.*—The following General Order by His Excellency the Governor General of India in Council, is re-published.

GENERAL ORDER BY HIS EXCELLENCY THE GOVERNOR  
GENERAL OF INDIA IN COUNCIL.

*Fort William, the 25th October 1861.*

No. 978 of 1861.—With reference to Government General Order No. 523\* of the 18th May 1860, the following Royal Warrant is published for general information and guidance :—

*Circular No. 702.*

VICTORIA, R

WHEREAS We judged it expedient, by Our Royal Warrant of the 1st March 1860, to allow well-conducted Soldiers

\* Madras, G. O. G. 1st June 1860, No. 259.



**OPINION.**—The injuries sustained by these Carriages, ~~as~~ observed are in the boxes of the newly introduced fixed Elevating Screws, and in the hooks to which the drag shoes are suspended.

2.—As the injuries to the Elevating screw boxes are entirely confined to the bolts, four of which are screw bolts, and four rivetted, the Committee recommend the substitution of bolts of larger diameter, for which there appears to be sufficient space, without either injury to the plates or interference with the working of the Elevating Screw apparatus.

3.—As this proof has demonstrated the severe tension to which the bolts of fixed Elevating Screws are subjected, it is desirable that the iron to be used in their construction be specially selected for the purpose, and that copper washers be introduced under each nut.

4.—To remedy the defect in the hooks to which the drag shoes are suspended, as the weight of the shoe with chain attached to it is upwards of 40lbs., the Committee recommend that the hooks be brought close up to the axletree beds, and that the shanks of them be lengthened into bolts to admit of their being passed through the axle case, and then secured by nuts.

*Observations of the Commander-in-Chief on Article 841, in letter<sup>(b)</sup> from the Adjutant General of the Army, Fort Saint George, to the Secretary to Government, Military Department.*—The Commander-in-Chief thinks that the opinion of the Select Committee should be acted upon.

*Orders of Government on Article 841.*—The Governor in Council concurs with the Commander-in-Chief “that the opinion of the Select Committee should be acted upon.”

## MEETING 214.

EXTRACT FROM THE PROCEEDINGS OF THE MADRAS PERMANENT SELECT COMMITTEE OF ARTILLERY OFFICERS, ASSEMBLED BY ORDER OF LIEUTENANT COLONEL T. K. WHISTLER BRIGADIER COMMANDANT OF ARTILLERY.  
*Artillery Depot, Saint Thomas' Mount, 14th September 1860.*

## PRESENT.

LIEUT.-COL. G. BRIGGS, *Commanding 1st Battalion Artillery.*  
LIEUT.-COL. J. MAITLAND, *Superintendent Gun Carriage Manufactory.*  
LIEUT.-COL. C. J. COOKE, *Commanding 5th Battalion Artillery.*  
MAJOR. B. W. BLACK, *Director Artillery Depot.*  
MAJOR T. H. CAMPBELL, *Acting Principal Commissary of Ordnance.*  
CAPTAIN W. C. F. GOSLING, *Commanding Madras Artillery Recruit Depot.*  
CAPTAIN B. C. HITCHINS, *4th Battalion Artillery.*  
CAPTAIN E. H. COUCHMAN, *Assistant Adjutant General of Artillery.*

## ARTICLE 842.

AS TO WHAT IS THE BEST DESCRIPTION OF WOOD FOR RAMMER HEADS.

(a.) Meeting 198, Article 749, 28th February 1857, Artillery Records page 543.

The Select Committee having recommended at a former Meeting<sup>(a.)</sup> experiments with Rammer-heads made of other hard woods before deciding on the adoption of the pattern then before them, and the same having been carried out, the undermentioned documents are laid before them.

(b.) No. 494. 31st October 1857.

1.—*Letter<sup>(b)</sup> from the Director of the Artillery Depot to the Officers Commanding 1st & 5th Battalions of Artillery, Mount.*—Forwards Howitzer and Gun Spunges made of "Peemah wood," "Peengandoo wood," and "Baubool wood."—Requests they may be used on all occasions of Drill and Exercise, under constant careful observation and record of the results of the trial, and after being fully tested, a report to be forwarded for the Commandant's information and submission to the Artillery Select Committee as to the best description of Wood considered most suitable for Rammer Heads of Light Field Spunges.

(c.) No. 95,  
5th April 1859.

2.—*Letter<sup>(c.)</sup> from the Officer Commanding 5th Battalion, Madras Artillery to the Director Artillery Depot.*—Reports upon the sponges received for trial as follows:—

“*Sponges No. 1, Peemah wood.*”—The Rammer Heads of these Sponges appear to be of a coarse grain, and the surface liable to wear away from use.

*Sponges No. 2, Feengandoo wood.*—The Rammer Heads of these sponges are of a short grain wood, and liable to chip off at the edges.

*Sponges No. 3, Baubool wood.*—Appears to be of a hard close grain wood, and the most suitable for the purpose, having stood the test better than either of the other two descriptions of wood.

(d.) No. 182,  
7th April 1859.

3. *Letter<sup>(d)</sup> from the Officer Commanding 1st Battalion Madras Artillery to the Director Artillery Depot.*—Reports “that the sponges sent for trial, have not been very much used, in consequence of there not being a Battery with the Battalion, and the men generally being Recruits and not fit for Gun Drill. Sufficient use has however being made of them, to establish the fact, that Peemah wood is the best calculated for Rammer Heads, and Peengandoo the next. Of those made of Baubool, one has slightly cracked, the other is sound.”

(e.) Meeting 196,  
Article 779,  
26th May 1859,  
Artillery Records  
page 651.

Also with reference to former Proceedings<sup>(e.)</sup> of the Committee.

(f.) No. 26,  
10th January 1859

4.—*Letter<sup>(f.)</sup> from the Acting Director Artillery Depot to the Officer Commanding Madras Artillery in Mysore, Bangalore.*—Informing him that

the Rammer Heads made of Burmese wood as per margin, have been despatched by Banghy.—Requests they may be brought into use on all occasions of Drill

4 of 24 Pdr. Howr., marked No. 27 and 38.  
4 of 12 " " " " 27 " 90  
4 of 9 " Gun " not numbered.  
4 of 9 " " marked No. 27 and 28  
4 of 6 " " " " 90

and Exercise with the Troop of Horse Artillery, and Horse Field Battery at Bangalore, under constant careful observation, and after being fully tested a report to be forwarded for the Commandant's information, and submission to the Permanent Artillery Select Committee.

(g) No. 1053,  
21st September 1859.

5. *Letter (g) from the Officer Commanding Madras Artillery Mysore Division, Bangalore, to the Director Artillery Depôt.* Reports upon Rammer Heads made of Burmese woods, which have been used on all occasions of Drill and Exercise with the Troop of Horse Artillery at Bangalore, under constant and careful observation; only one, No. 27, failed by fair usage, those of dark wood seem more durable, being of heavier and closer grain, but all are serviceable and well adapted for the purpose—much more so than teak.

#### REMARKS.

4 12-Pdr. Howitzer, No. 27 and 90. None broken.

4 6 „ Gun „ 27 and 28. 2 of 27 broken, one at Drill the 2nd. time out, the 2nd. at Range Practice, the Ball being rammed home harder than usual,—having got loose, and dragged along the ground.

4 6-Pdr. Gun, No. 90. 1 of 90 broken at Range Practice, the ball having stuck in bore, and rammed home hard by two men.

(h) No. 519,  
9th July 1860.

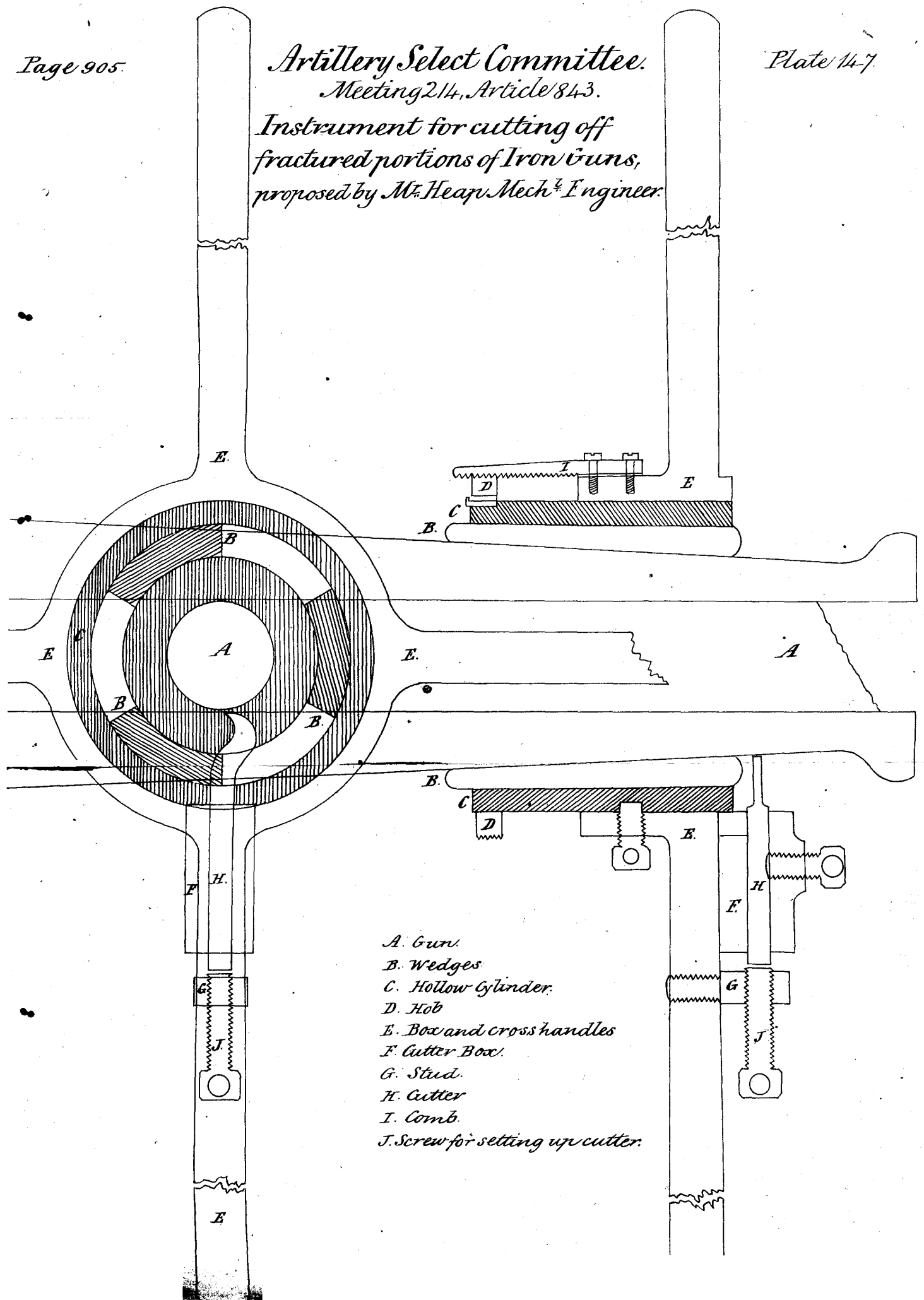
6. *Letter (h) from the Officer Commanding Horse Brigade Artillery Bangalore, to the Director of the Artillery Depôt.*—Reports, that the Rammer Heads for Light Field Sponges, made of Burmese wood, have been kept in constant use up to this date with the C. Troop of the Brigade under his Command, and are still serviceable, with the exception of one\* as per margin.

\* Broken at Horse Artillery Exercise, having stuck in the Chamber when rammed home, there being no wad in it, and blown out with Powder.

Artillery Select Committee.

Meeting 214, Article 843.

Instrument for cutting off fractured portions of Iron Guns, proposed by Mr. Heape, Mech<sup>l</sup> Engineer.



- A. Gun.
- B. Wedges
- C. Hollow Cylinder.
- D. Hob
- E. Box and cross handles
- F. Cutter Box.
- G. Stud.
- H. Cutter
- I. Comb.
- J. Screw for setting up cutter.

**OPINION.**—The Report upon the Rammer Heads made of Burmese woods, which have been in constant use in the Troop of Horse Artillery at Bangalore for more than 18 months is very satisfactory, more particularly with reference to the wood marked “No. 28”.—This wood is therefore in the opinion of the Committee well adapted for Rammer Heads, as are also Peemah and Baubool.

*Observations of the Acting Inspector General of Ordnance on Article 842.*—The Acting Inspector General concurs in opinion with the Committee.

*Observations of the Brigadier Commandant of Artillery on Article 842.*—The Brigadier Commandant of Artillery can form no very correct opinion from a perusal of the documents attached to these Proceedings, as to which is the best wood for Rammer Heads, but would be inclined to think the “hard and close grained” as preferable.

*Observations of the Commander-in-Chief on Article 842.*—The Commander-in-Chief concurs in the opinion recorded by the Select Committee, and Inspector General of Ordnance and Magazines.

*Orders of Government on Article 842.*—The Governor in Council concurs in His Excellency the Commander-in-Chief's remarks on the subject submitted.

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## ARTICLE 843

### ON A PROPOSED INSTRUMENT FOR CUTTING OFF FRACTURED PORTIONS OF IRON GUNS &c. PLATE 147.

(a) No. 5445  
24th September 1859.

• The Acting Inspector General of Ordnance forwards<sup>(a)</sup> for submission to the Select Committee a sketch of an original Instrument for cutting off fractured portions of Iron guns or Water pipes, proposed by Mr Heap, Mechanical Engineer attached to the Bullet Factory, with copy of a descriptive Memorandum<sup>(b)</sup> of the same.

(b) dated  
17th September 1859.

## MEMORANDUM.

Having observed at page 678, of a publication called the Artillery Records, under the heading "Remarks on the Ordnance used in the Siege at Sebâstapol," that a heavy Lancaster Gun split in the muzzle by an enemy's Shell during the Bombardment, was rendered useless (useful?) till the end of the Siege, by having a foot (I presume the broken

\* Performed in a tedious way, by using a cross cut Chisel and Hammer.

part) cut\* off from the muzzle, I was induced to turn my attention to the manufacture of an

Instrument that would cut off the muzzles of Ordnance similarly injured, without removing them from their Battery or Carriage, and which will also cut large Iron piping, and cut a screw if necessary at the end for joining.

The instrument can be readily carried on service, and can be easily worked by two men, who should be able to cut through a piece of heavy Ordnance in about two hours.

† Platé 147.

The following is a description of the instrument, (a sketch accompanies†) in its mode of operating.

Place the part *C*, on the Gun at the spot required to be cut off, then secure it in its place by driving home the Iron wedges *B*, then put on the cross handle *E*, the cutter *H*, being attached with set screw *J*; the operator will then see readily the way to work, which is simply by tightening the set screw on the head of the cutter, and pulling the cross handle round which runs loose on box *C*—by continuing this operation, I feel confident that in two hours, the muzzle of an 8 inch Gun will be cut through. ●

The invention is purely original, there being nothing of the kind in use at Woolwich, or that I am aware of in England.

I am prepared to make the instrument if required, on being supplied with the necessary materials.

MADRAS,  
17th September 1859. } •

(Signed) JOHN HEAP,  
Engineer.

**OPINION.**—Mr. Heap is deserving of much credit for turning his attention to subjects likely to be of use in the Ordnance Service, but on the present occasion the Committee believe that the Instrument proposed by him would not produce the results he expects from it, nor do the Committee consider that an Instrument of the kind would be required sufficiently often to make it desirable to introduce it as an article of Ordnance equipment.

*Observations of the Brigadier Commandant of Artillery on Article 843.*—The Brigadier Commandant is of opinion with the Select Committee.

*Observations of the Commander-in-Chief on Article 843.*—While the Commander-in-Chief gives full credit to Mr. Heap, His Excellency agrees with the Commandant of Artillery, and Select Committee, that it is inexpedient to carry out the proposal of that gentleman.

*Orders of Government on Article 843.*—The Governor in Council concurs in His Excellency the Commander-in-Chief's remarks on the subject submitted.

#### ARTICLE 844.

**ON A 9-POUNDER LIGHT FIELD CARRIAGE OF THE ESTABLISHED PATTERN WITH ALTERATIONS MADE THEREIN, AS RECOMMENDED BY THE SELECT COMMITTEE IN ARTICLE 841 OF MEETING 213, 14TH AUGUST 1860.**

The undermentioned documents are laid before the Committee.

(a.) Meeting 213, Article 841, 14th August 1860, Artillery Records page 298.

1. *Proceedings<sup>(a)</sup> of the Madras Permanent Select Committee.*

(b.) No. 227, 28th August 1860.

2. *Letter<sup>(b)</sup> from the Director Artillery Depot to the Acting Inspector General of Ordnance.*—Suggests, with reference to extract from the Proceedings of the Permanent Select Committee of Artillery Officers, Meeting 213, Article 841, on injuries sustained a



proof by certain Light Field Carriages of the established pattern, that these Carriages be sent from the Field Train to the Gun Carriage Manufactory, to await further orders for the substitution of Bolts of larger diameter, as proposed by the Committee.

[e.] No. 3596,  
1st September 1860.

3. *Letter<sup>[e]</sup> from the Acting Inspector General of Ordnance to the Director Artillery Depot.*—Acknowledges receipt of the above letter and states, “ that the Superintendent Gun Carriage Manufactory, “ has requested that the Carriages referred to therein may “ be sent to the Manufactory, two at a time, for the pur- “ pose of being repaired, and afterward sent to the Mount “ for a second inspection of the Select Committee.”

2. “ In accordance however with your suggestion, the “ Carriages in question may be forwarded to the Gun Car- “ riage Manufactory to await further orders for the substi- “ tution of bolts of larger diameter.”

[d] No. 327  
3rd. September 1860.

4.—*Letter<sup>[d]</sup> from the Director Artillery Depot to the Acting Inspector General of Ordnance.*—“ Referring to your orders\* for the removal from the Gun Carriage yard, of a 9 Pdr. Light Field Carriage, (and certain other

\* *Endorsed on letter from the Superintendent Gun Carriage Manufactory, to the Inspector General No. 693, 21st August 1860.*

Carriages) and to my letter to your address, No. 327, dated 28th Ultimo, and presuming that the Elevating Screw Apparatus and Drag Shoe Hook of this Carriage have been constructed in conformity with the opinion on these points arrived at by the Select Committee in their last Meeting (Meeting No. 213 and Article 841,) I have now to request I may be favored with instructions as to whether this Carriage is to be proved, and the report forwarded to you in ordinary course.”

[e] No. 3767  
9th September 1860.

5.—*Letter<sup>[e]</sup> from the Acting Inspector General of Ordnance to the Director Artillery Depot.*—Requests that the 9 Pdr. Light Field Car-

riage referred to in the foregoing letter may be submitted to the Artillery Select Committee, before proving it.

**OPINION.**—The Committee observing the four Carriages Light Field, one of each calibre, to be experimentally strengthened by additional

\* Vide Proceedings Select Committee Meeting 208, Article 824, 19th January 1860, Artillery Records pages 821 to 825. bolts,\* have not yet been prepared, and also taking

into consideration the additional strain that Carriages are now to be subjected to by the substitution of the fixed<sup>1</sup> for the Capstan headed Elevating Screw, strongly urge the expediency of at once having a Carriage of each of the four calibres built with Elevating Screws attached, and strengthened with bolts to the same extent as in the Carriages of the Royal Artillery pattern, and that the same be subjected to proof at the earliest practicable date.

2. With reference to that portion of the question relating to the Elevating Screw apparatus, the Committee recommend that the 9-Pounder Carriage before them be proved at once.

*Observations of the Inspector General of Ordnance on Article 844.*—Under existing circumstances, the Acting Inspector General cannot support the proposition submitted by the Committee, the whole question of Artillery Equipment being now under the consideration of the Supreme Government with a view to the adoption of one system for the whole Artillery serving in India.

*Observations of the Brigadier Commandant of Artillery on Article 844.*—The Brigadier Commandant concurs in the observations by the Acting Inspector General of Ordnance and Magazines, but recommends that the proof of the 9 Pounder Carriage, alluded to in Para. 2 of these Proceedings be at once carried out.

*Observations of the Commander-in-Chief on Article 844.*—The Commander-in-Chief agrees with the Commandant of Artillery, and the Inspector General of Ordnance and Magazines, that it is desirable under present circumstances, to defer carrying out the suggestions of the Select Committee.

2. The 9-Pounder Carriage can be proved at once.

*Orders of Government on Article 844.*—The Governor in Council concurs in His Excellency the Commander-in-Chief's remarks on the subject submitted.

## MEETING 215.

**EXTRACT FROM THE PROCEEDINGS OF THE MADRAS PERMANENT SELECT COMMITTEE OF ARTILLERY OFFICERS, ASSEMBLED BY ORDER OF COLONEL T. K. WHISTLER BRIGADIER COMMANDANT OF ARTILLERY.**

*Artillery Depot, Saint Thomas' Mount, 7th December 1860.*

### PRESENT.

LIEUT.-COL. G. BRIGGS, *Commanding 1st Battalion Artillery.*  
 LIEUT.-COL. J. MAITLAND, *Superintendent Gun Carriage Manufactory.*  
 LIEUT.-COL. C. J. COOKE, *Commanding 5th Battalion Artillery.*  
 MAJOR. B. W. BLACK, *Director Artillery Depot.*  
 MAJOR T. H. CAMPBELL, *Acting Principal Commissary of Ordnance.*  
 CAPTAIN W. C. F. GOSLING, *Commanding Madras Artillery Recruit Depot.*  
 CAPTAIN B. C. HITCHINS, *5th Battalion Artillery.*  
 CAPTAIN E. H. COUCHMAN, *Assistant Adjutant General of Artillery.*

## ARTICLE 845.

**ON RING SHOT GAUGES, CYLINDER SHOT GAUGES, AND A PENDULUM AND STAND, RECEIVED FROM ENGLAND.**

(a.) No. 7352  
 25th November 1859.

The Acting Inspector General of Ordnance requests<sup>(a)</sup> that the above mentioned

articles recently received from England, may be submitted for the opinion of the Select Committee.

**OPINION.**—The Committee are of opinion that one set of Cylinder Gauges, and a due allotment of Ring Gauges should be in each Arsenal.

2. The Committee do not recommend the introduction of the Pendulum and Stand, or Metronome, as it is not an instrument so well adapted for the accurate measurement of small intervals of time, as the self registering instrument already in use at the Artillery Depot for that purpose, which marks fifths of seconds.

*Observations of the Brigadier Commandant of Artillery on Article 845.*—Of opinion with the Committee.

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## ARTICLE 846.

### ON THE MARKING OF THE AXIS LINE ON THE TRUNNIONS OF IRON GUNS.

(a) No. 3581  
31st August 1860.

The Acting Inspector General of Ordnance forwards<sup>(a)</sup> copy of the Horse Guards Regimental Order No. 423, dated 7th April 1860, with a request that it may be submitted for the opinion of the Select Committee, as to the advisability of carrying out the order enjoined in Para. 10, directing the cutting of the axis line on the trunnions of all iron guns.

**OPINION.**—As it has been decided that the face of the trunnions of all iron guns in the Royal Service, shall in future be marked with a line corresponding with the axis of the piece, the Committee recommend that the measure be extended to the iron guns now within the range of the Madras Presidency.

## ROYAL ARTILLERY.

No. 423.

*Horse Guards S. W. 7th April 1860.**General Regimental Order.*

10. It having been decided that the face of the trunnions of all Iron Guns shall in future be marked with a line representing the axis of the piece, in order to facilitate the laying of the Guns in "depression firing," Commanding Officers of Artillery are, forthwith, to cause the axis line to be marked upon the trunnions of all Iron Guns in the Districts under their Command. The following instructions are promulgated for the guidance of the Government Artificers who are to be employed in this duty:—

## RULES.

for the guidance of Artificers, &c., at Out-post Stations, in cutting the axis line on trunnions of Guns:—

1. Let the Gun be levelled with the trunnions horizontal, then with a Quadrant or other spirit level, lay the gun point blank.

2. With a pair of Compasses set off on the end of the trunnion, the distance the top of the trunnion is above the centre of the bore—this distance to be taken from the accompanying Table—then take a straight edge about two or three feet long, and place the edge fair with the mark set off on the end of the trunnion, place the spirit level, as taken from the bore, on the top of the straight edge, and set it level—care being taken to keep the edge fair with the mark on end of trunnion—as soon as it is level, draw a line with a scribe across the end of the trunnion, then take a graver or diamond point Chisel, and cut the line to the required depth, care being taken to cut it to the line drawn by the scribe.

TABLE.

Showing the distance the top of Trunnion is, above the centre of the Bore.

Nature of Gun.	Distance from top of trunnion to centre of Bore.	Nature of Gun.	Distance from top of trunnion to centre of Bore.
10 Inch 87 Cwt...	1.97	56-Pdr. 98 Cwt...	1.82
10 " 84 " ...	1.97	" " 87 " ...	1.82
68-Pdr. 112 " ...	2.02	32 " 64 " ...	1.6
" " 95 " ...	2.02	" " 58 " ...	1.6
" " 87 " ...	2.02	" " 50 " ...	1.58
8 Inch 65 " ...	2.6	" " 48 " ...	1.58
" " 60 " ...	2.6	(Miller.)	
" " 52 " ...	2.6		
42-Pdr. 84 " ...	1.75	32-Pdr. 45 Cwt... B	1.58
" " 75 " ...	1.75	" " 42 " ... C	1.58
" " 67 " ...	1.75	" " 25 " ... New	1.05

Bloomfield, and all old pattern Guns, the top of the Trunnion is in line with the centre of bore.

(True Extract.)

(Signed) B. W. BLACK, Major

*Secretary Permanent Select Committee of Artillery Officers.*

*Observations of the Acting Inspector General of Ordnance and Magazines on Article 846.*—The Acting Inspector General of Ordnance concurs in opinion with the Committee.

*Observations of the Brigadier Commandant of Artillery on Article 846.*—Of opinion with the Committee.

#### ARTICLE 847.

##### ON A CARRIAGE FOR AN 8 INCH GUN OF 51 CWT.

Meeting 267  
(a) Article 798  
23rd November, 1859.

The trials recommended by the Select Committee at a former Meeting,<sup>(a)</sup> having been sanctioned by the Madras Government, the further opinion of the Committee is called for with reference to the Proof Reports now before them, dated 23rd February 1859, and 5th October 1860.

Report of a Proof of the undermentioned Heavy Field Carriage by order of Colonel P. Hamond Brigadier Commandant of Artillery under instructions from the Inspector General of Ordnance and Magazines in letter No. 7243, dated 6th November 1858 and at the recommendation of the Permanent Artillery Select Committee in Meeting 201, Article 798, under date 23rd November 1858.

Date.	Description.	No. of Carriage.	No. of Firings.	Nature and strength of Powder.	Marks on the Ordnance.	Marks on the Carriage.	Metal.				Weight of				Shell.				Remarks.																
							Weight of.		Diameter of Bore.		Carriage.		Charge.		Weight of		Diameter of			Windage.	Elevation.		Recoil.	Time in firing.											
							cwt.	qrs.	lbs.	Ins.	Fts.	cwt.	qrs.	lbs.	ozs.	drs.	lbs.	ozs.	drs.		Ins.	Pzs.			P.	D.	M.	Feet.	Ins.	Minutes.					
23rd February 1859.	Carriage Wooden } experimental for a } Medium 8 inch Gun. }																																		
25th January 1859.		1	10	Madras C. P. September 1858 P. R. 1lb. 568 yards.	1854.	R. T. T. A.	J. M. 1856	61	1	0	8	0	21	8	9	0	0	56	0	0															
			2		L. T. 15	No. 1																													
			3																																
			4																																
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		20																																	

One round was fired on the 21st January, when the nut of the left small counter sunk bolt broke off, and the axletree band opened out. The carriage was then returned to the Manufactory and a second bolt added in rear of the fighting Trunnion holes. The Carriage underwent the established Proof on the 25th January and the additional Proof of 20 rounds on the 23rd February without sustaining injury. There were several Sun Cracks in the cheeks which were not affected by the Proof.

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Report of a Proof of the undermentioned Heavy Field Carriage at the recommendation of the Permanent Select Committee of Artillery Officers, in reference to a former Proof Report dated 23rd February 1859.

Description.	No. of Carriage.	No. of Firings.	Nature and strength of Powder.	Marks on the Ordnance.	Marks on the Carriage.	Metal.				Weight of				Shot Hollow.				Elevation.	Recoil.	Remarks.														
						Weight of		Diameter of Bore.		Carriage.		Charge.		Weight of		Diameter of					Windage.													
						cwt.	qrs.	lbs.	Ins.	Pls.	cwt.	qrs.	lbs.	ozs.	drms.	lbs.	ozs.	drs.	Ins.	Pls.		P.	D.	M.	Feet.	Ins.	Time in firing.							
Carriage Wooden experimental for a medium 8 Inch Gun.	1	1	Madras C. P. September 1858, 8 inch Mortar 1 lb. P. R. 666 yards.	1856 R. T. T. A. S. L. T. No. 15	J. M. 1858 No. 1	51	1	0	8			Body.	21	3	9	8		48		7	92	08			9	0	Stood the Proof uninjured.							
	2	2				9																												
	3	3				8																												
	4	4				7																												
	5	5				6																												
	6	6				5																												
	7	7				4																												
	8	8				3																												
	9	9				2																												
	10	10				1																												
	11	11				0																												
	12	12				0																												
	13	13				0																												
	14	14				0																												
	15	15				0																												

ARTILLERY DEPOT,  
SAINT THOMAS' MOUNT.  
5th October 1860.

(Signed) B. W. BLACK, Major,  
Director Artillery Depot.



OPINION.—The Committee with reference to the recent proof of this Carriage for an 8 Inch Iron Gun, consider it very satisfactory as regards the construction of Carriage. Taking the Gun and Carriage together, it is observed that it corresponds very nearly with the 24 Pdr. Iron Gun and Carriage as regards mobility,—the 8 Inch Gun and this Carriage being only  $3\frac{1}{2}$  Cwts. heavier than a 24 Pdr. Iron Gun and its Carriage.

2. The object for which the Carriage before the Committee was constructed, has not been mentioned, but although 8 Inch Guns, or 68 Pdrs, may be very valuable in the Field under special circumstances, the Committee are not prepared to recommend that Field Carriages for this description of Gun be constructed for general purposes.

*Observations of the Acting Inspector General of Ordnance and Magazines on Article 847.*—The 8 Inch Gun of 52 cwt. is one of the most valuable Pieces in the Service, combining, in a high degree, the properties of both Gun and Howitzer. In range and accuracy it is a far superior piece to either the 8 or 10 Inch Howitzers, and against earthworks, or indeed against any other than solid masonry defences, is a most effective breaching Gun. In this country therefore, it possesses special claims to adoption in our Siege Trains.

2. The Home Government has supplied thirty-three of these Guns for the Presidency, and it seems advisable, that the large stations of Nagpore and Secunderabad should each have two of them with Carriages, in reserve.

*Observations of the Brigadier Commandant of Artillery on Article 847.*—I concur in the observations made by Lieutenant Colonel Simpson and would further suggest that the 2nd. paragraph thereof should be complied with.

*Orders of Government on Article 847.*—The Governor in Council is of opinion that effect should be given to the suggestion in paragraph 2 of the observations by the Inspector General of Ordnance.

## ARTICLE 848.

ON A LOCK FOR SECURING AMMUNITION BOXES OF LIGHT  
FIELD CARRIAGES.

(a.) No. 4179 25th Sep-  
tember 1860.

The Acting Inspector General of Ordnance forwards<sup>(a)</sup> for submission to the Select Committee, a Lock of the pattern<sup>2</sup> in use with the Royal Artillery for securing Ammunition Boxes of Light Field Carriages.

OPINION.—The Committee are of opinion that a lock of the pattern before them, called, it is believed, a Till-lock, is not so well adapted for Ammunition Boxes of Batteries as Padlocks, because in event<sup>2</sup> of the key of a Till-lock being mislaid, the lock cannot on emergency be forced so easily as a Padlock, the staple of which can easily be broken by the blow of a hammer.

*Observations of the Brigadier Commandant of Artillery on Article 848.*—Of opinion with the Committee.

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## SELECT COMMITTEE PROCEEDINGS.

1861.

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### MEETING 216.

EXTRACT FROM THE PROCEEDINGS OF THE MADRAS PERMANENT SELECT COMMITTEE OF ARTILLERY OFFICERS, ASSEMBLED BY ORDER OF COLONEL T. K. WHISTLER, BRIGADIER COMMANDANT OF ARTILLERY.

*Artillery Depot, Saint Thomas' Mount, 27th March 1861.*

#### PRESENT.

LIEUT.-COL. J. MAITLAND, *Superintendent Gun Carriage Manufactory.*

LIEUT.-COL. C. J. COOKE, *Commanding 5th Battalion Artillery.*

LIEUT.-COL. B. W. BLACK, *Director Artillery Depot.*

LIEUT.-COL. J. L. BARROW, *Principal Commissary of Ordnance.*

CAPTAIN W. C. F. GOSLING, *Commanding Madras Artillery Recruit Depot.*

CAPTAIN E. H. COUCHMAN, *Assistant Adjutant General of Artillery.*

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#### ARTICLE 849.

ON A MADRAS TRAVERSING GUN PLATFORM OF IMPROVED CONSTRUCTION, BY LIEUT.-COL. J. MAITLAND.—IN CONTINUATION OF ARTICLE 805, MEETING 203, 23RD MARCH 1859\*.

The undermentioned documents are laid before the Committee.

(a.) No. 106.  
14th March 1860.

1.—*Letter<sup>(a)</sup> from the Officer Commanding Artillery Centre Division, to the Director Artillery Depot.*—Reports that the experimental Platform was used throughout the late Practice at St Thomas' Mount with a 24 Pounder Gun and Carriage, fired with service charge; and submits observations as follows.—

“ 1st.—The recoil was smooth and easy, in no way detrimental to the Platform, and with the Ballard rope in proper hands, the Carriage was very manageable.”

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\* Artillery Records page 770.

"2nd.—→Much delay was experienced in laying this Platform, owing to the nicety required in fitting the wedges placed under the wheel and trail planks so as to pass the bolts through both, which must be done in a very awkward position, as they are so close to the ground that it is very difficult to get the hand underneath to fit on and screw up the nuts of the bolts which bind the planks, wedges, and ribbands together. All this might be obviated, by the substitution of a centre sleeper of such increased dimensions as to compensate for the removal of the wedges."

"There would be another advantage, as two sets of bolts (six in each) are at present obliged to be carried, viz., a long set with three wedges for the 24 Pounder Gun Carriage, and a short and lighter set (without wedges) for the 12 and 18 Pounders; whereas under the proposed arrangement, the same Platform would suit all the Calibres of Heavy Field Ordnance with the smaller bolts, and without wedges at all, and there would be no loss of time in laying the Platform."

(b.) No. 184.  
9th March 1861.

2.—*Letter<sup>(b)</sup> from the Officer Commanding Madras Artillery, Centre Division, to the Director Artillery Depot.*—Submits the following observations, regarding the experimental Platform. "It has been used throughout the Annual Practice lately concluded at this Station with a 24 Pounder Gun and Carriage. The Gun has generally been fired with service charges."

"The Platform proved efficient; the two iron bars connecting the wheel planks were bent by the concussion caused by the recoil; they will of course require strengthening."

"It is requisite to apply handspikes to the wheel planks, as well as to the centre planks to traverse this Platform properly; I consider that it would traverse more freely, if the centre plank were prolonged, and bolted to the front sleeper, as in the old Madras Traversing Gun Platform. The slope of the centre plank is very great, and may, in my opinion be somewhat reduced."

**OPINION.**—The Reports on the use of this Platform with a 24 Pounder Gun during two successive Practices being favorable, the Committee recommend its introduction, but restricted in its use to 24 Pounds, the present established pattern being retained for 12 and 18 Pounds.

*Observations of the Inspector General of Ordnance on Article 849.*—It is most necessary that perfect uniformity in Artillery Equipment should obtain in the Artilleries of India. The Inspector General suggests that copies of the Proceeding of the Committee, with Plans, be forwarded to the Secretaries of the Select Committees of the Bengal and Bombay Artilleries, and their opinion obtained, before further steps are taken in this Presidency.

*Observations of the Brigadier Commandant of Artillery on Article 849.*—I fully concur in the observations attached to these Proceedings by the Inspector General of Ordnance.

*Orders of Government on Article 849.*—The Governor in Council concurs in the observations by the Inspector General of Ordnance, and considers that, although the reports attached are not sufficiently favorable to warrant the permanent adoption of the Platform in question at present, they are favorable enough to justify its submission to the Select Committees of Bengal and Bombay as proposed.

### ARTICLES 850.

**ON A PROPOSED INCREASE IN THE THICKNESS OF THE TYRE OF THE WHEELS OF LIGHT FIELD CARRIAGES.**

[a] No. 8591,  
7th March 1861.

The Acting Inspector General of Ordnance forwards<sup>[a]</sup> the undermentioned correspondence for the opinion of the Select Committee.

[b] No. 1227,  
17th February 1861.

1.—*Letter<sup>[b]</sup> from the Officer Commanding No. 2 Battery 13th Brigade Royal Artillery, to the Officer Commanding Royal Artillery H. S. Force.*—Reports that, during the past week several of the

Felloes and Spokes of the Gun Wheels of the Battery under his command, lately ring-tyred at the Arsenal have given way, owing, in his opinion, to the ring-tyres being much too slight,  $\frac{1}{2}$  Inch iron appearing by no means strong enough for the wheels of 9 Pdr. Equipment, and adds, "that in no case has English wood given way since the wheels have been ring-tyred.—The whole of the accidents are with the Country Teak which is supplied by the Arsenal, both for Felloes and Spokes."

[c] No. 246,  
23rd February 1861.

2.—*Letter*<sup>[c]</sup> from the Officer Commanding Royal Artillery Madras Presidency to the Inspector General of Ordnance.—Forwards the above letter, and suggests that the tyres be made stouter and that other wood be employed,—as it would appear from the last paragraph of the letter that the wood used for the Felloes and Spokes is of inferior quality.

[d] No. 159,  
4th March 1861.

3.—*Letter*<sup>[d]</sup> from the Superintendent Gun Carriage Manufactory to the Inspector General of Ordnance.—States, with reference to the above correspondence, that he entirely concurs with Major Godby, that the  $\frac{1}{2}$  inch Tyres are by no means strong enough, and would again urge that  $\frac{5}{8}$  or  $\frac{3}{4}$  Inch thickness of Tyre may be substituted.—Gives the preference to the  $\frac{3}{4}$  Inch. Teak wood Felloes with this Tyre would no doubt withstand the shock of firing.

OPINION.—Experience having shewn that  $\frac{1}{2}$  is not a sufficient thickness for tyres of the wheels of Light Field Ordnance, the Committee are of opinion that the old established thickness of tyre, namely  $\frac{5}{8}$  should be reverted to, which is in assimilation in this respect with the practice in the Royal Artillery.

*Observations of the Inspector General of Ordnance on Article 850.*—The Inspector General of Ordnance and Magazines concurs in opinion with the Committee, and recom-

mends that the Tyres of all Light Field Carriage wheels be in future  $\frac{3}{4}$  of an inch thick.

*Observations of the Brigadier Commandant of Artillery on Article 850.*—I concur in opinion with the Select Committee, and would further recommend that a report upon the wood used for the Felloes and Spokes reported by the Officer Commanding Royal Artillery, as appearing to him to have been of inferior quality.—*Vide* letter 246, Proceedings—be called for.

*Orders of Government on Article 850.*—Approved.

### ARTICLE 851.

#### ON PROPOSED ALTERATIONS IN MOUNTAIN TRAIN CARRIAGES.

(a) No. 8568  
8th March 1861

The Acting Inspector General of Ordnance forwards (a) the undermentioned correspondence for submission to the Select Committee.

(b) Dated  
12th February  
1861.

1.—*Letter (b) from 2nd Captain J. McK. Macintyre to the Director Artillery Depot.*

“ Having had some little experience on service with a Mountain Train Battery, and having also been present at the Mount when the Mountain Train Guns were being experimented upon by the Select Committee, of which I was at the time a Member, I would beg, if it would not be considered presumptuous on my part, to point out a few things which appear to me capable of improvement.”

“ I.—The whole of the small chains attached to the different fastenings are too short.—The consequence is that great delay frequently occurs when any of these have to be undone, the slightest twist in the chain increasing the difficulty.”

“ II.—In trying to make all the iron work as light as possible, strength has in some cases been sacrificed, for instance all the clasps and fastenings of the limber boxes are far too slight to stand much knocking about.”

“ III.—There are no proper loops to fasten the trace hooks of the Harness to, when the shafts are used with ponies.”

“ IV.—The Tyres of the wheels appear to me to be too narrow. They cut very deeply into any soft ground they have to go over, I think it would be an improvement to have the Tyres at least half an inch broader and the wheels themselves a little more dished so as to decrease the chance of the Gun or Limber upsetting.”

“ V.—The Howitzers themselves far exceeded my expectations of them. I found that I was able to make excellent practice with them up to about 1,200 yards.”

“ VI.—Instead of Tar and Grease, we were provided with Vegetable wax, (I believe as an experiment) I have no hesitation in saying that for lubricating purposes it is equally good if not better, and as regards cleanliness, far superior.”

“ VII.—Serjeant Leithead, late attaché to the A. Company 5th Battalion as Store Sergeant, has written such an admirable report on the Stores of the Battery, that it would be useless my adding anything to it further than to say that having read it through carefully, I perfectly agree with him in almost all his remarks.”

(c) No. 59.  
18th February  
1861.

2.—*Letter* <sup>(c)</sup> *from the Brigadier Commandant of Artillery, to the Inspector General of Ordnance.*—Forwards copy of the above letter, and suggests consideration of the several points brought to notice by Captain Macintyre, with which view the opinion of the Superintendent of the Gun Carriage Manufactory thereon, might with advantage be called for.

[d] No. 147.  
27th February  
1861.

3.—*Letter* <sup>[d]</sup> *from the Superintendent Gun Carriage Manufactory, to the Inspector General of Ordnance.*—Forwards the following observations, with reference to the foregoing correspondence.

“ 2.—The chains of the Mountain Train Carriages can be easily made longer by adding a few more links to them.”



"3.—The clasps and fastenings of the limber Boxes can be strengthened to whatever extent it is necessary.

"4.—If Captain Macintyre, will have the goodness to state the description of the Trace Hooks to suit the Harness, and point out where they should be fixed, his suggestion can be carried out."

"5.—In the construction of Mountain Train Carriage Wheels, one great object has been to keep them as light as possible for the convenience of carrying them over mountains and through jungles, and therefore their Tyres are made as narrow as possible. I doubt the possibility of making wheels that can each be carried by one man, of dimensions suitable for travelling through paddy-fields; to meet this object, if the Felloes and Tyres are made broader, they will become too heavy for mountain warfare, and thus defeat the original object for which these Carriages are made."

"6.—The Spokes might be dish'd a trifle to increase the breadth of base."

**OPINION.**—The Committee recommend that Trace Hooks be attached to the Shafts of the Limbers of the Mountain Train Equipment, the pattern and position of which, the Committee suggest be fixed by the Superintendent of the Gun Carriage Manufactory in communication with the Principal Commissary of Ordnance; also that the clasps and fastenings of the boxes be strengthened, and that a swivel link be introduced into each small chain, with the view to remedy the complaint of their twisting,—but the Committee do not recommend the suggested modification in the construction of the wheels, as such change would involve an increase of weight, an objection which would more than outweigh any advantage expected from the proposed change.

*Observations of the Inspector General of Ordnance on Article 851.*—The Inspector General concurs in the opinion recorded by the Committee.

*Observations of the Brigadier Commandant of Artillery on Article 851.*—I concur in opinion with the Select Committee.

*Orders of Government on Article 851.*—Approved.

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ARTICLE 852.

ON A PLATFORM FOR 10 AND 8 INCH MORTARS PROPOSED BY LABORATORY SERJEANT C. B. WHITE, IN CONTINUATION OF ARTICLE 806, MEETING 203, 23D MARCH 1859\*.

(a.) No. 108,  
14th March 1860.

*Letter<sup>(a)</sup> from the Officer Commanding Madras Artillery Centre Division, to the Director Artillery Depot.*—Reports that the Platform was used during the Practice at Saint Thomas' Mount in 1860 and stood perfectly well; it was observed to have more spring in it than any other Mortar Platform causing the Mortar-Bed to jump very perceptibly;—is however quite broad enough to admit of the cross planks being shortened and still to be available for a 10-inch Mortar, it is also not improbable that the centre sleeper may have sunk, and as proofs of powder are constantly required to be carried on, suggests that this Platform be re-laid and used for the 8 inch Eprouvette Mortar in its present dimensions, when if found still to have the same fault, it might be modified and have a further trial.

*Note.*—On the 28th April 1860, 14 inches were cut off the ends of each plank and the Platform again laid at the Practice ground.

(b) No. 185,  
9th March 1861.

*Letter<sup>(b)</sup> from the Officer Commanding Madras Artillery Centre Division, to the Director Artillery Depot.*—Reports that the Platform had

been used with a 10-Inch Mortar throughout the Annual Practice at Saint Thomas' Mount in 1861, has answered very well, and does not call for any particular remark as regards its serviceableness when laid; notices however, that when it was being laid there was some difficulty in putting it together, probably from the wood of which it was constructed having become warped. The contrivance shews ingenuity, but considers the want of facility in putting together platforms of this description when the wood of which they are made has shrunk or become warped, constitutes an objection to its introduction into the Service.—Prefers the Traversing Mortar Platform for Mortars of all Calibres.

**OPINION.**—The Committee having inspected the Platform for Mortars proposed by Laboratory Sergeant White, which, after it had been reduced in dimensions, as recommended by the Officer Commanding the Artillery Centre Division, at the conclusion of the Practice of 1860, was used with a 10-inch Iron Mortar throughout the recent Practice, concur with the Officer Commanding Artillery Centre Division in preferring the Established Traversing Platform of one pattern for all Mortars, but varying in dimensions according to the calibre of the Mortars; that is, the pattern introduced from Bombay and known as “Miller's pattern.”

*Observations of the Inspector General of Ordnance on Article 852.*

The Inspector General concurs in the opinion recorded by the Committee.

*Observations of the Brigadier Commandant of Artillery on Article 852.*—Of opinion with the Select Committee.

*Orders of Government on Article 852.*—Approved.

## MEETING 217.

EXTRACT FROM THE PROCEEDINGS OF THE MADRAS PERMANENT SELECT  
COMMITTEE OF ARTILLERY OFFICERS, ASSEMBLED BY ORDER OF COLONEL  
T. K. WHISTLER, BRIGADIER COMMANDANT OF ARTILLERY.

*Artillery Depot, Saint Thomas' Mount, 15th April 1861.*

## PRESENT.

LIEUT.-COL. J. MAITLAND, *Superintendent Gun Carriage Manufactory.*  
LIEUT.-COL. B. W. BLACK, *Director Artillery Depot.*  
LIEUT.-COL. W. K. WORSTER, *Madras Artillery.*  
LIEUT.-COL. J. L. BARROW, *Principal Commissary of Ordnance.*  
CAPTAIN W. C. F. GOSLING, *Commanding Madras Artillery Recruit Depot.*  
CAPTAIN A. STEWART, *Madras Artillery.*  
CAPTAIN E. H. COUCHMAN, *Assistant Adjutant General of Artillery.*

## ARTICLE 853.

ON THE ORGANIZATION, DETAIL, AND EQUIPMENT OF AR-  
TILLERY FOR SERVICE IN INDIA.

• No. 1510  
30th March 1861.

The Adjutant General of the Army for-  
wards\* for the report of the Select Com-  
mittee, Printed Proceedings of a Special Committee of  
Artillery Officers assembled at Meerut, to report on Subjects  
connected with the Organization, Detail, and Equipment of  
Artillery for Service in India.

Proceedings of a Special Committee of Artillery Officers, assembled  
at Meerut under instructions from Government, as communicated  
in General Orders, dated 16th November 1859, for the considera-  
tion of subjects connected with the Organization, Detail, and  
Equipment of Artillery for Service in India, with a view to uni-  
formity in the three Presidencies.

## PRESIDENT.

COLONEL SIR GEORGE BARKER, K. C. B. *Royal Artillery.*

## MEMBERS.

COLONEL C. HOGGE, C. B. *Bengal Artillery.*  
LIEUT.-COLONEL A. HUYSHE, *Bengal Horse Artillery.*  
LIEUT.-COLONEL E. PRICE, C. B., *Royal Horse Artillery.*  
LIEUT.-COLONEL E. B. JOHNSON, C. B., *Bengal Artillery A. A. G.*

## SECRETARY.

CAPTAIN A. CALVERT, *Royal Artillery Assistant Adjutant General.*

## REPORT.

INSTRUCTIONS from Major General Sir William Mansfield, Appendix—A. K. C. B., Chief of the Staff, for the guidance of the Committee, dated 18th December, 1859, are read.

Before entering upon the subjects submitted for their consideration in these instructions, the Committee consider Appendix—B. that information on the following points should be at once obtained from Madras and Bombay, and direct that the Commandants of Artillery in each of those Presidencies, be communicated with in accordance with paragraph 10, of the Instructions.

1.—As to the existing Establishments of Officers, Non-Commissioned Officers, and Men, Horses, and Natives of all denominations, for Troops of Horse Artillery, Field Batteries, and Reserve or Garrison Companies, to which Heavy Field Batteries are liable to be attached.

2.—Each detail to be accompanied by a statement shewing the pay of every individual in the Establishment, and the total expense incurred by Government for each Battery for one Month.

3.—As to the mode of keeping the Carriages and Equipment in repair and the Horses shod, whether by the grant of a Contract allowance to Officers in Command, or by the issue of stores from Magazines; where the Contract System is in force, the rates of allowances to be shown.

4.—As to the source of supply, whether from England or from Native Establishments, of Harness and Equipment generally; the expense of each Article, its weight and the time it is supposed to last.

5.—As to the nature of Small Arms in use, both with Gunners and Drivers, whether of Horse Artillery, Field

Batteries, or Garrison Companies; the number of Carbines with each Battery, and quantity of Ammunition carried.

6.—The Commandants of Artillery to be invited to offer suggestions upon the subjects under consideration by the Committee, which they may think likely to assist them in arriving at a satisfactory decision.

The Committee also direct that Officers Commanding Batteries of Royal Artillery in India, be requested to send Statements, showing the amounts of their monthly Contingent Bills for repairs of Harness and Carriages, since the receipt of their English Equipment.

Pending the receipt of the above information from Madras and Bombay, the Committee proceed to the consideration of the strength of Batteries and Brigades; the following Details have been most carefully prepared, and with every regard for economy; and as the Committee consider they cannot be further reduced consistently with the efficiency of the Artillery Service in this Country, it is recommended that the Establishments now proposed be maintained at all times as complete as possible.

The Details are accompanied by Tables, showing the expense to the Government, of Batteries of the Royal Artillery, and of Batteries of the Artillery of the three Presidencies, according to the existing Establishments; but in the Field Batteries of Bengal, European Drivers are substituted for the Native Drivers formerly employed; but which either have been already, or it is presumed, will be discontinued.

The Establishments now proposed show an expenditure of Rs. 8,423 per month of 30 days, for Batteries of Horse Artillery; of Rs. 7,444 for Batteries of Field Artillery; and of Rs. 4,960 for Batteries for Garrison duty, or to which Heavy Field Batteries are liable to be attached; being an increase over similar Establishments in the Bengal Service of

Rs. 595 per month, for Batteries of Horse Artillery, as proposed by the Bengal Members for their own system; of Rs. 721 for Batteries of Field Artillery; and of Rs. 752 for Garrison Batteries.

As compared with the present Establishments in Madras, the proposed Details show an increase of Rs. 716 per month for Batteries of Horse Artillery; a decrease of Rs. 4 for Batteries of Field Artillery; and an increase of Rs. 706 for Garrison Batteries.

As compared with the Establishments in the Bombay Presidency, they show a decrease of Rs. 434 for Batteries of Horse Artillery; of Rs. 659 for Batteries of Field Artillery; and an increase of Rs. 350 for Garrison Batteries. At the same time they show a decrease from the expense of the existing Establishments in the Royal Artillery, viz., Rs. 503 per month for Batteries of Horse Artillery; and Rs. 558 for Batteries of Field Artillery. But supposing the following Return of European Batteries now existing in India to be correct, viz:—

	Horse Artillery.	Field Battery.	Reserve.
Royal Artillery .. ..	4	20	0
Bengal Artillery .. ..	13	14	10
Madras Artillery .. ..	4	11	5
Bombay Artillery .. ..	4	11	1

*Vide Tables.* it then appears that there will be but little difference in the expense to Government as regards the present Force of European Artillery, whether uniformly organized upon the scale now proposed, or in accordance with the various systems existing in the three Presidencies, while at the same time by the new Details a considerable increase in numbers is gained; and when the more perfect efficiency of the Artillery Service, which cannot fail to result from this addition to the Force, is taken into consideration, the Committee feel that even a much greater increase of Expenditure, could not be objected to

for the purpose of maintaining so important an arm as that of the Artillery.

With regard to the Horse Artillery, the Committee recommend that the Detachment System, as existing in the Royal and Bombay Horse Artillery, and partially so in that of Madras, be adopted, in place of mounting the Gunners upon the off horses of the Teams.

*A Minute is appended by Lieut. Colonel Huyshe, Bengal Horse Artillery*

MINUTE.

As regards the proposed Troop of Horse Artillery on the Detachment System, I am unable to agree that any more perfect efficiency will be gained by its substitution for the system now in force in the Bengal Horse Artillery, which, when it has been kept up to its proper compliment in men, has never yet failed.

As I recognize the necessity for assimilation, and as the Bengal System does not obtain in either the Royal Service or in that of Madras or Bombay, I would not wish to advocate its retention, but I do altogether dissent from the number of Draught Horses proposed to be allowed for a Horse Artillery Troop on the Detachment System, because from my experience of marching with guns in India, I feel confident a Troop so horsed, would fail in doing the work that might fairly be expected of it, on the very first occasion of having any heavy marching over a difficulty country, or on meeting with the casualties which may be looked for on Actual Service.

(Signed) A. HUYSHE, Lieut. Colonel.

I concur in the above remarks.

(Signed) E. B. JOHNSON, Lieut. Colonel.

I concur.

(Signed) C. HOGGE, Colonel.



## MINUTE BY THE PRESIDENT AND ROYAL ARTILLERY MEMBERS.

The number of Spare Horses allowed to Batteries in European Warfare is about one-tenth; and as the Details now proposed give a proportion of nearly one-sixth Spare Horses, we cannot agree with Lt. Col. Huysha, Lt. Col. Johnson, and Col. Hogge, in their anticipation of failure on the part of the Horse Artillery, in the efficient performance of any duties that may be required of them. Serious losses or casualties in action would of course be replaced as soon as possible from the Reserves in rear of an Army. One of the numerous advantages which, in our opinion, the Detachment System possesses over the system in the Bengal Horse Artillery, is, that it obviates the necessity of taking the Ammunition Waggon under fire, a practice, which we believe is never allowed in any Horse Artillery, except a part of the Indian, and which, if attempted in other countries, would probably be attended with disastrous consequences.

(Signed) G. R. BARKER, Colonel, Royal Artillery.

E. PRICE, Lt. Col., Royal Horse Artillery.

A. M. CALVERT, Capt., Royal Artillery.

DETAIL FOR A 6 POUNDER BATTERY, HORSE ARTILLERY ON  
THE DETACHMENT SYSTEM.

1 First Captain.	8 Sergeants.
1 Second Captain.	6 Corporals.
3 Lieutenants.	8 Bombardiers.
1 Assistant Surgeon.	80 Gunners, } 145 Gunners & Drivers.
1 Serjeant Major.	65 Drivers, }
1 Quarter Master Sergeant.	2 Trumpeters (one acting).

With regard to Artificers, the Committee admit the desirability of maintaining a certain Establishment of European Artificers in the Royal Artillery, in consideration of their liability to be called upon for Service away from India, and the inconvenience which might, in such cases, result from their dependance upon Native workmen only; at the same time, for the sake of economy they recommend a reduction in the present Establishment, and as it will then not be suffi-

cient to keep the Horses shod, and the Equipment of the Battery in repair, the Committee consider that Native assistance should be provided out of the Contract Allowances.

As regards the Batteries on the permanent Establishment of the Indian Artillery, the Committee recommend that, while maintaining nearly the same number of Natives as those allowed by existing Regulations, there should be, in addition, a small Establishment of Europeans, for superintendence; any further assistance that may be required, being provided as at present, out of the Contract Allowance.

PROPOSED ESTABLISHMENT OF ARTIFICERS.

ROYAL ARTILLERY\*

*Europeans.*

1 Farrier.		2 Collar Makers.
4 Shoeing Smiths.		2 Wheelers.

INDIAN ARTILLERY.

*Europeans.*

1 Farrier.		1 Collar Maker.
2 Shoeing Smiths.		1 Wheeler.

*Natives.*

1 Mochie.		2 Filemen.
1 Mistry Carpenter.		2 Firemen.
2 Workmen Carpenters.		2 Hammermen.

MINUTE BY THE PRESIDENT.

There can be no question as to the superiority of European Workmen, and I cannot conceive that there would be any difficulty in procuring them for the Service in India; it would be the means, moreover, of introducing a very useful class of men into this Country; they should be enlisted and instructed at Home, in the same manner as the Artificers in the Royal Artillery, and the system, once adopted, a certain number of Gunners should be always under Instruction in the various shops, to assist in keeping the Establishments complete. The necessity of maintaining a certain Establish-

\* *Vide* Minute by the Committee (at the conclusion of this Report.)

ment of European Artificers in the Royal Artillery, has been acknowledged by the Committee, and as the present object in view is the assimilation of the Artillery Services, I consider that the same Establishment should have been recommended for all.

The Commandant of Artillery in the Madras Presidency concurs with me in thinking it desirable to employ Europeans, assisted by a small Establishment of Natives.

I should recommend the following Establishment for the whole of the Artillery in this Country:—

*Europeans.*

1 Farrier.		2 Collar Makers.
4 Shoeing Smiths.		2 Wheelers,

*Natives.*

4 Nalbunds.		2 Carpenters.
2 Moochies		

The whole to be paid by Government if the Contract System is abolished; but if generally adopted, the Native Workmen to be paid by the Officer Commanding the Battery, out of his Contract Allowance, for Repairs, &c. I have on a former occasion recommended this Establishment to the Commander-in-Chief for the Royal Artillery in India.

(Signed) G. R. BARKER, Col., Royal Artillery.

6 POUNDER BATTERY, HORSE ARTILLERY—*continued*

Carriages.	Horses.	Harness.	
4 Guns,.....	24	Double Sets, Wheel, ....	18
2 Howitzers,.....	12	Double Sets, Lead,.....	31
6 Ammunition Waggon,	36	Breast Harness, (Single)	24
1 Forge Waggon,.....	6	Horse Appointments,....	70
2 Store Carts,.....	8		
Spare Draught,.....	18		
	104		
Riding,.....	64		
Riding, Spare,.....	10		
Total,..	178		

## NATIVE ESTABLISHMENT.

3 Jemadars of Syces.	1 Tindal.
118 Syces.—Being one for each pair of Horses in Draught, and one for every two Gunners' Horses in the Detachments, and one for each Non Commissioned Officer, Artificer, Trumpeter, and Spare Horse.	12 Store Lascars.
178 Grasscutters.—Being one for each Horse, or Joorawallas, in proportion at the discretion of the Commanding Officer.	2 Bheesties, for washing and cleaning the Guns, Carriages, &c., Forge, and Sick Horses.
	1 Sweeper, for Gun Park.
	3 Bullock Drivers, permanently attached.

The Committee onit noticing the Native Establishment for the service of the European Soldiers, which they consider should be regulated by the existing Scale in each Presidency.

As regards Grass-cutters, it appears that a different system exists in the Bombay Presidency, where the proportion is about one to three horses, grass being also purchased. The Committee do not think it desirable to interfere with this arrangement.

In addition to the Carriages mentioned in the foregoing Detail, and recommended to be horsed, there should be one Store Limber Wagon, one spare Howitzer Carriage, and one Hospital Cart, attached to the Battery, to be drawn by Bullocks; the first by 8, the second by 6, and the last by 2, with 3 spare; Total 19.

Spare Ammunition Waggons to be provided in the proportion of one to each piece of Ordnance with the Battery, to be drawn by Bullocks; 6 each, and one-sixth spare; Total 42.

At places where it may not be thought necessary by the Commander-in-Chief, or by the General Officer Commanding the Division, that these Carriages (spare Ammunition Waggons) should be kept with the Battery as a part of its own Park, they should be placed as a Reserve in the nearest Magazine.

On a change of quarters taking place between two Batteries with similar equipments, it would be a saving of expense, if the spare ammunition waggons remained stationary, and were transferred from one Battery to the other.

The Committee recommend that, of the Bullocks kept for the purpose of drawing the Spare Carriages and Ammunition Waggons, seven (7) shall be permanently attached to the Battery for general work in Cantonments, according to the present System.

*A Minute is entered by the President, who dissents from the Committee as regards the Spare Ammunition Waggons:—*

MINUTE.

The number of Spare Ammunition Waggons recommended for the 6 Pounder Battery, viz., one for each piece of Ordnance, gives 342 rounds per Gun, and 236 per Howitzer, which I consider more than sufficient, and a bad proportion. The three Waggons allowed in the Royal Horse Artillery, are in my opinion, sufficient for a Battery of Horse Artillery, which should not be encumbered with too many Carriages; and with the smaller number, the whole of the Carriages might possibly be horsed, which would be of great advantage in this branch of the Service. It is argued, that on more than one occasion, the Bengal Artillery have found themselves, even with 6 Spare Waggons, at a critical moment, with little or no Ammunition; this can, I imagine, only have been caused by too much dependance being placed upon the Reserves of the Battery itself, instead of upon the general Park of Artillery, an error which this large number of Waggons is likely to induce. With regard to the 6 Waggons as recommended by the Committee, I consider that three (3) for the Guns, and three (3) for the Howitzers, would give a much better proportion of Ammunition, viz., 305 rounds for each Gun, and 287 for each Howitzer. The number of Carriages with Batteries of Artillery cause great

inconvenience on the line of march, and should be reduced as much as possible.

(Signed) G. R. BARKER, Colonel, Royal Artillery.

I concur with the President.

(Signed) E. PRICE, Lt. Col., Royal Horse Artillery.

I concur.

(Signed) A. M. CALVERT, Capt., Royal Horse Arty.

REMARKS BY LIEUT. COLONEL JOHNSON, BENGAL ARTILLERY,  
ON THE ABOVE MINUTE, RELATIVE TO THE AMOUNT OF  
PROPORTION OF AMMUNITION.

In determining the amount of Ammunition, it should be borne in mind, that in action, the expenditure of Gun Ammunition is nearly double that of the Howitzer per piece, as for one round of the latter, nearly two of the former is fired away. The proportion of Gun Ammunition, therefore, per piece, should be considerably greater than that per Howitzer. It possesses also a manifest advantage and convenience, the arrangement which provides a Spare Ammunition Waggon for each piece, as when a Troop or Battery is divided and sub-divided, no disarrangement of Ammunition becomes necessary, each piece being self-contained and independent.

(Signed) E. B. JOHNSON, Lieut. Colonel.

We agree with the above.

(Signed) A. HUYSHE, Lieut. Colonel.  
C. HOGGE, Colonel.

Although a Veterinary Surgeon has not been included in the foregoing details, the Committee recommend that when practicable, one should be attached to each Battery, except where two Batteries are quartered together, when one Veterinary Surgeon will be sufficient for both the Batteries.

A Hospital Serjeant, Hospital Orderly, Rough Rider, and School Master, are included in these details, all of which will be necessary for each Battery; and on Service an additional Non-Commissioned Officer will be required as Conductor of Stores. The additional pay of these men is shewn in the Tables appended to these Proceedings.

With regard to Trumpeters, the Committee recommend that the enlistment of Boys as Half Pay Trumpeters in the Indian Artillery, be continued, as a provision for the children of old Soldiers in Her Majesty's Indian Service.

MINUTE BY COLONEL HOGGE.

I dissent from the proposal to introduce the separate system of Gunner and Driver, as in the Royal Horse Artillery. It probably has been found to answer well in England, where two distinct classes of men are always available, viz., large and powerful men for Gunners, and small for Drivers; but in India, where the recruits are much more of an average size, and the casualties so numerous, it is very desirable that every man joining a Troop of Horse Artillery, should be able to perform any duty whether as a Gunner or a Driver. This is the system in the Royal Foot Artillery; and I would assimilate the Gunner and Driver in everything making them one body, and on the same footing as regards pay and promotion.

(Signed) C. HOGGE, Colonel.

I entirely concur in this opinion, and especially deprecate any difference being made in the pay of Gunner and Driver of the Horse Artillery, a system which obtains in the Royal Artillery on grounds which do not hold good in India.

(Signed) E. B. JOHNSON, Lieut. Colonel.

I fully concur in the above.

(Signed) A. HUYSHÉ, Lieut. Colonel.

## MINUTE BY THE PRESIDENT ON THE ABOVE DISSENT.

The Members of the Committee belonging to the Bengal Artillery, appear to be under a misapprehension with regard to the Gunner and Driver system existing in the Royal Artillery. Every recruit is enlisted for the Regiment at large, as a Gunner and Driver, and is liable for all the duties of an Artilleryman, and each man is, as far as practicable, instructed in them. Short men under a certain standard are told off as Drivers; and should a Driver in the Horse Artillery grow to the requisite height for a Gunner, he is at the first vacancy in the number of Gunners raised to the Gunners' pay, and when perfect in his drills takes his place in the detachment. A Driver at home having two horses and their harness to look after, cannot of course receive as much instruction in Gun and other drills as a Gunner, who has only one horse and his appointments to take care of. But the following General order by His Royal Highness the Duke of Cambridge is carried out as far as practicable:—

“ It being very desirable that every man in the Regiment should be thoroughly acquainted with the whole of the duties of an Artillery Soldier, Commanding Officers will be held responsible that the Drivers are instructed, as far as possible, as Gunners, and the Gunners, when practicable, in Driving Drill.”

With regard to the difference of pay in the Royal Horse Artillery, the following extract from the Finance Regulations of the Regiment will explain the reasons for the extra pay being granted to the Gunners of the Horse Artillery:—

“ An addition of two-pence a-day is made to the pay of each Non-Commissioned Officer and man (Drivers excepted) of the Horse Artillery and Riding House Establishment, in consideration of the extraordinary and constant attention required in their Regimental duties, which deprives them of the occasional advantages arising from being employed



‘ in the Works, for which an allowance is granted to the  
‘ Non-Commissioned Officers and men of the Foot Artillery.’”

The Drivers of the Horse Artillery were excepted as they also were occasionally employed with their horses in the Public Works. On the arrival of the Royal Horse Artillery in India, the pay of the Indian Horse Artillery, which was then higher than that of the Indian Foot Artillery, was raised to the same scale as the Royal Horse Artillery, but as the grounds upon which the additional two-pence a-day was granted to the Non-Commissioned Officers and Gunners of the Royal Horse Artillery did not exist in India, there seems to have been scarcely sufficient reason for any alteration in the pay of the Indian Horse Artillery.

It would certainly not have been just on the arrival of the Royal Horse Artillery in India, nor would it be so now, to reduce the pay of the Gunners of that branch of the Service, but I conceive there can be no reason for now raising the pay of the Drivers to the same rate; in such case, both the Gunners and Drivers of the Royal (Foot) Artillery might be expected to claim the same rate of pay, being enlisted for the same Regiment, and to a certain extent, having the same duties to perform, when attached to Field Batteries.

(Signed) G. R. BARKER, Colonel, Royal Artillery.

SECOND MINUTE BY COLONEL HOGGE, ON THE SUBJECT OF  
GUNNER AND DRIVER.

I cannot admit that I am under any misapprehension with regard to the system of Gunner and Driver in the Royal Horse Artillery. In my Minute I objected to there being two Classes of men, one to drive and the other to serve the Guns. Sir George Barker, in reply, states that every Man is enlisted as a Gunner and Driver, and is expected to be able to perform either duty, and quotes an order by His Royal Highness, the Duke of Cambridge, on the subject.

I can only say that on questioning two Officers of the Royal Horse Artillery, Lieut. Colonel Price, and Captain Calvert, who are both Members of the Committee, they both stated that the Drivers having so much to do looking after their Horses and Harness, it was quite impossible to teach them the different drills.

The Drivers have separate Non-Commissioned Officers, 2 Corporals and 3 Bombardiers, and lastly, that the Drivers, receive different rates of pay.

If these facts are correctly stated, it is evident that whatever the order on the subject may be, my former Minute, assuming that the Gunner and Driver form separate Classes in the Royal Horse Artillery, was based on good grounds.

Sir George Barker states, that with regard to the difference of pay, formerly, Gunners and Drivers were paid alike; but that owing to the latter Class having opportunities of earning money, when employed on the Public Works, the pay of the Gunner was raised twopence a-day, to place them on an equal footing. As Sir George Barker admits that the Drivers have not the same chance of earning money in this Country, it seems a strong argument for placing them on the same rate of pay.

Signed, C. HOGGE, Colonel.

We concur.

Signed, A. HUYSHE, Lieut. Colonel.  
E. B. JOHNSON, Lieut. Colonel.

### RECAPITULATION.

DETAIL OF A 6 POUNDER BATTERY, HORSE ARTILLERY, AS  
PROPOSED BY COMMITTEE FOR SERVICE IN INDIA.

1 First Captain.  
1 Second Captain.

3 Lieutenants.  
1 Assistant Surgeon.

A Veterinary Surgeon to be attached to each Battery if practicable, or to two Batteries when stationed together.

1 Sergeant Major.	8 Bombardiers.
1 Quarter Master Sergeant.	80 Gunners.
8 Sergeants.	65 Drivers.
6 Corporals.	2 Trumpeters (one acting.)

## ARTIFICERS.

## ROYAL ARTILLERY.\*

## INDIAN ARTILLERY.

<i>Europeans.</i>	<i>Europeans.</i>	<i>Natives</i>
1 Farrier.	1 Farrier.	1 Moolchie.
4 Shoeing Smiths.	2 Shoeing Smiths.	1 Mistry Carpenter.
2 Collar Makers.	1 Collar Maker.	2 Workmen Carpenters
2 Wheelers.	1 Wheeler.	2 Filemen.
		2 Firemen.
		2 Hammermen.

## NATIVE ESTABLISHMENT.

8 Jemadars of Syca.	2 Bheesties.	} Permanently attached.
118 Syca.	1 Sweeper.	
178 Grasscutters.	3 Bullock Drivers, and	
1 Tindal.	7 Bullocks.	
12 Store Lascars.		

\* *Vide* Minute by the Committee (at the conclusion of this Report.)

**DISTRIBUTION of a 6 Pounder Battery, Horse Artillery, as proposed by Committee, for Service in India.**

No. of Carriages.												Horses.		Natives.						Harness Double Sets.		Brest Harness.					
	Serjeant Major.	Qr. Master Sergeant.	Sergeants.	Corporals.	Bombardiers.	Gunners.	Drivers.	Trumpeters.	Farrier.	Shoeing Smith.	Collar Maker.	Wheeler.	Total.	Riding	Draught.	Bullocks.	Syces.	Grasscutters	Store Lascars	Bheesties.	Sweepers.		Bullock Drivers.	Horse Appointments.	Lead.	Wheel.	
4	6 Pounder Guns, ..	1	4	2	2	32	12	1	1	1	1	1	56	36	24	36	60						36	8	4	16	<b>INDIAN ESTABLISHMENT OF ARTIFICERS.</b>  <i>Europeans.</i> 1 Farrier. 2 Shoeing Smiths. 1 Collar Maker. 1 Wheeler.  <i>Natives.</i> 1 Mochie. 1 Mistry Carpenter. 2 Workmen Carpenters. 2 Filemen. 2 Firemen. 2 Hammermen.
2	12 Pounder Howitzers, ..	2	2	2	14	6	1	1	1	1	1	36	18	12	19	30						18	4	2	8		
6	Ammunition Waggons, ..	1	1	1	12	18						36	4	36	22	40	13 <sup>d</sup>					4	12	6			
1	Forge Waggon, ..						3		1			4		6	3	6							2	1		1	
2	Store Carts, ..						4					4		8	4	8							2	2		2	
1	Store Limber Waggon, ..									1	1	2				8						4					
1	Spare Howitzer Carriage,															6						3					
1	Hospital Cart, ..		1 <sup>a</sup>									2	1		2	1	1					1	1				
	Spare Men and Horses, Jemadars of Syces, Bullocks, &c.,			2	3	21	22					48	15	18	3	36 <sup>c</sup>	33		2	1	1	11	3	3		3	
18	<b>Total, ..</b>	1	1	8	6	80	65	2	1	4	2	2	180	74	104	19	121	178	13	2	1	9	70	31	18	24	

<sup>a</sup> Hospital Sergeant.

<sup>b</sup> Hospital Orderly.

<sup>c</sup> Including 3 Jemadars.

<sup>d</sup> Including 1 Tindal.

An additional Non-Commissioned Officer to be allowed in the Field as Conductor of Stores.

TABLE shewing the difference between the Present Establishment of Batteries of Royal Horse Artillery, and that proposed by Committee for Indian Service.

	Staff Sergeants.	Sergeants.	Corporals.	Bombardiers.	Gunners.	Drivers.	Trumpeters.	Farrers.	Shoeing Smiths.	Collar Makers.	Wheelers.	Horses.	Jemadars of Syces.	Syces.	Grascutters.	Tindal.	Store Lascars.	Bheesties.	Sweepers.	Bullock Drivers.
Present Establishment,...	2	9	6	9	90	70	1	1	6	3	3	200	...	100	200	...	6	2	1	3
Proposed Establishment,	2	9	6	9	80	65	2	1	4	2	2	178	3	118	178	1	12	2	1	2
Decrease, ... ..	...	1	...	1	10	5	...	...	2	1	1	22	...	...	22	...	...	...	...	...
Increase, ... ..	...	...	...	...	...	...	1	...	...	...	...	...	8	18	...	1	6	...	...	...

DECREASE.				INCREASE.			
		R.	A. P.			R.	A. P.
1	Sergeant,...	39	2 11	1	Acting Trumpeter, ...	16	3 7
1	Bombardier,...	26	15 0	1	Tindal, ...	7	8 0
10	Gunners,...	162	3 10	6	Store Lascars, ...	36	0 0
5	Drivers, ...	68	14 1	3	Jemadars of Syces, ...	21	0 0
2	Shoeing Smiths,...	56	15 0	18	Syces, ...	72	0 0
1	Collar Maker, ...	25	6 6		Saving to Public,...	503	4 3
1	Wheeler,...	25	6 6				
20	Rations, ...	125	0 0				
	Head money, ...	5	0 0				
22	Grascutters, ...	77	0 0				
22	Horses' Head and Heel ropes, ...	44	0 0				
		655	15 10			655	15 10

a 1 Acting Trumpeter,

**DETAIL OF A 6 POUNDER TROOP, HORSE ARTILLERY, ON THE  
BENGAL SYSTEM.**

*Europeans.*

<p>1 Captain. 1 Second Captain. 3 Lieutenants. 1 Assistant Surgeon. 2 Staff Sergeants. 7 Sergeants. 6 Corporals. 6 Bombardiers.</p>		<p>108 Gunners. 1 Trumpeter. 1 Acting Trumpeter. 2 Half-Pay Trumpeters. 1 Farrier. 2 Shoeing Smiths. 1 Collar Maker. 1 Wheeler.</p>
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*Natives.*

<p>3 Jemadars of Syces. 170 Syces. 170 Grasscutters. 1 Tindal. 12 Store Lascars. 2 Bheesties. 3 Bullock Drivers.</p>		<p>1 Moochie. 1 Mistry Carpenter. 2 Workmen Carpenters. 2 Filemen. 2 Firemen. 2 Hammermen</p>
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Carriages	Horses.
4 Gun, .. .. .	24
2 Howitzers, .. .. .	12
6 Ammunition Waggons, .. .. .	36
1 Forge Waggon, .. .. .	6
2 Store Carts, .. .. .	8
Spare Draught, .. .. .	64
	150
Riding Horses, .. .. .	16
Spare Horses, .. .. .	4
	170

In addition to the above, 59 Bullocks will be required to draw the spare Ammunition Waggons, spare Howitzer Carriage, and Store Waggon.

The foregoing Detail has been drawn up in accordance with paragraph 2 of the Instructions, and for the purpose of comparing the expense of the two systems; the Committee, however, having in view the chief object of their delibera-

tions, viz., the perfect assimilation of the Services, have already submitted what they consider the best Detail for Horse Artillery in India, and therefore do not recommend this for adoption.

**PROPOSED DETAIL FOR A 9 POUNDER BATTERY, FOR INDIAN SERVICE.**

1 First Captain.		3 Lieutenants (one on 2nd Lieut's Pay.)
1 Second Captain.		1 Assistant Surgeon.

It may not be practicable in all cases, to distribute the Subaltern Officers according to the above detail, and it may be necessary to place three (3) Lieutenants on the higher rate of pay to one Battery, while another Battery has two on the lower rate; but the meaning of the Committee is, that two-thirds of the full establishments of Lieutenants shall be, as now, on the higher rate of pay.

1 Sergeant Major.	}	8 Bombardiers.	} 145 Gunners and Drivers.
1 Quarter Master Sergeant.		80 Gunners.	
8 Sergeants.		65 Drivers.	
6 Corporals.		2 Trumpeters (one Acting.)	

**ARTIFICERS.**

**ROYAL ARTILLERY\***

*Europeans.*

1 Farrier.		2 Collar Makers.
4 Shoeing Smiths.		2 Wheelers.

**INDIAN ARTILLERY.**

*Europeans.*

1 Farrier.		1 Collar Maker.
2 Shoeing Smiths.		1 Wheeler.

*Natives.*

1 Mochie.		2 Filemen.
1 Mistry Carpenter.		2 Firemen.
2 Workmen Carpenters.		2 Hammermen.

\* *Vide* Minute by the Committee (at the conclusion of this Report.)

Carriages.	Horses.	Harness.	
4 Guns,.....	32	Double Sets, Wheel, ....	
2 Howitzers,.....	16	Double Sets, Lead,.....	17
6 Ammunition Waggon,.....	48	Breast Harness,.....	42
1 Forge Waggon,.....	6	Horse Appointments,.....	12
1 Store Cart,.....	4		20
Spare Draught,.....	18		
	124		
Riding Horses for mounted Non-Commissioned Officers,.....	20		
Spare,.....	2		
Total,...	146		

## NATIVE ESTABLISHMENT.

3 Jemadars of Syces.	1 Tindal.
93 Syces,—Being one for each pair of Horses in Draught, and one for each Non Commissioned Officer, Artificer, Trumpeter, and Spare Horse.	12 Store Lascars.
146 Grasscutters,—Being one for each Horse, or Joorwallas, in proportion at the discretion of the Commanding Officer.	2 Bheesties,—For Washing Guns and Carriages, Forge, and Sick Horses.
	1 Sweeper,—For Park.
	3 Bullock Drivers, to be permanently attached, for general purposes in Cantonments.

In addition to the Carriages already mentioned, there should be one Store Limber Waggon, one Store Cart, one Spare Howitzer Carriage, and one Hospital Cart; these Carriages to be drawn by Bullocks, the first by 8, the next two by 6 each, and the last by 2, with 4 spare. Total, 26.

Spare Ammunition Waggon in the proportion of one to each piece of Ordnance, must also be provided, to be drawn by Bullocks, six each, with one-sixth spare. Total, 42.

Seven of the Bullocks to be permanently attached to the Battery, for general purposes in Cantonments.

The remark made by the Committee relative to the spare Ammunition Waggon of a 6 Pounder Battery of Horse Artillery, moving with, and remaining with, the Park of the Battery, applies equally to those of a 9 Pounder Battery.



*A Minute is appended by the President, who dissents from the decision of the Committee as regards the Spare Waggon:—*

MINUTE.

I again object to this distribution of the spare Waggon, viz., one to each piece of Ordnance, which gives 224 rounds for each 9 Pounder Gun, and only 144 for each 24 Pounder Howitzer. If six (6) spare Waggon are to be attached to the Battery, it would, in my opinion, be better to allow 3 Waggon for the Guns and 3 for the Howitzers, giving 200 rounds for the former, and 174 for the latter; I consider, however, that the number of Waggon allowed in the Royal Artillery at present, sufficient, although one extra is not of much importance.

(Signed) G. R. BARKER, Colonel, Royal Artillery.

I think that 3 Waggon for the Guns and 3 for the Howitzers, will give a better proportion of Ammunition than a spare Waggon to each piece.

(Signed) E. PRICE, Lieut. Colonel Royal Horse Arty.

I concur in the above.

(Signed) C. M. CALVERT, Captain Royal Horse Arty.

As regards Veterinary Surgeons, see remarks to 6 Pounder Battery of Horse Artillery.

In the Detail of a 9 Pounder Field Battery, it may be thought that the number of horses proposed, is rather large, but taking into consideration the very inferior description of horse generally allotted to the Field Batteries, in fact, the worst that are passed into the Service, the Committee cannot recommend any reduction in this respect, but they would submit for consideration, the necessity of an alteration in the manner of allotting horses to the different Services.

## RECAPITULATION.

### DETAIL OF A 9 POUNDER FIELD BATTERY, AS PROPOSED BY COMMITTEE FOR SERVICE IN INDIA.

1 First Captain,	3 Lieutenants.
1 Second Captain.	1 Assistant Surgeon.

A Veterinary Surgeon to be attached to each Battery if practicable, or to two Batteries when stationed together.

1 Serjeant Major.	8 Bombardiers.
1 Quarter Master Serjeant	80 Gunners. } 145 Gunners and Drivers.
8 Serjeants.	65 Drivers. }
6 Corporals.	2 Trumpeters (one acting).

#### ARTIFICERS.

#### ROYAL ARTILLERY.\*

*Europeans.*

1 Farrier.
4 Shoeing Smiths.
2 Collar Makers.
2 Wheelers.

#### INDIAN ARTILLERY.

<i>Europeans.</i>	<i>Europeans.</i>	<i>Natives.</i>
1 Farrier.	1 Farrier.	1 Mochie.
2 Shoeing Smiths.	2 Shoeing Smiths.	1 Mistry Carpenter.
1 Collar Maker.	1 Collar Maker.	2 Workmen Carpenters.
1 Wheeler.	1 Wheeler.	2 Filemen
		2 Firemen.
		2 Hammermen.

#### NATIVE ESTABLISHMENT.

3 Jemadars of Syces.	12 Store Lascars.
93 Syces.	2 Bheesties.
146 Grasscutters.	1 Sweeper.
1 Tindal.	3 Bullock Drivers.

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\* *Vide* Minute by the Committee (at the conclusion of this Report.)

**DISTRIBUTION of a 9 Pounder Field Battery, as proposed by Committee, for Service in India.**

No. of Carriages.		Sergeant Major.	Gr. Master Sergeant.	Sergeants.	Corporals.	Bombardiers.	Gunners.	Drivers.	Trumpeters.	Farrier.	Shoeing Smith.	Collar Maker.	Wheeler.	Total.	Horses.			Natives.						Harness Double Sets.		Brest Harness.		
															Riding.	Draught.	Bullocks.	Syces.	Grasscutters.	Store Lascars.	Bheesties.	Sweepers.	Bullock Drivers.	Horse Appointments.	Lead.		Wheel.	
4	9 Pounder Guns, ..	1	4	2	2	32	16	1	1	1	1	1	1	60	12	32	28	44	21	2	12	12	4	8	<b>INDIAN ESTABLISHMENT OF ARTIFICERS.</b>  <i>Europeans.</i> 1 Farrier. 2 Shoeing Smiths. 1 Wheeler. 1 Collar Maker.  <i>Natives.</i> 1 Moochie. 1 Mistry Carpenter. 2 Workmen Carpenters. 2 Filemen. 2 Firemen. 2 Hammermen.			
2	24 Pounder Howitzers, ..	2	2	2	14	8	1	..	..	..	..	..	..	29	5	16	13	21	..	..	5	6	2	4				
6	Ammunition Waggons, ..	1	1	1	12	24	..	..	..	..	1	1	1	43	2	48	26	50	13 <sup>d</sup>	..	2	18	6	..				
1	Forge Waggon, ..	..	..	..	..	..	..	3	..	..	2	..	..	5	..	6	8	6	..	..	2	1	..	..				
2	Store Carts, ..	..	..	..	..	..	..	2	..	..	..	..	..	2	..	4	6	2	4	..	..	1	1	..				
1	Store Limber Waggon, ..	..	..	..	..	..	..	..	..	..	1	1	..	2	..	..	8	..	..	..	..	..	..	..				
1	Spare Howitzer Carriage, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..				
1	Hospital Cart, ..	..	1 <sup>a</sup>	..	1 <sup>b</sup>	..	..	..	..	..	..	..	..	2	1	..	2	1	1	..	1	1	..	..				
	Spare Men and Horses, } Jemadars of Syces, Bullocks, &c.,	..	..	1	3	21	12	..	..	..	..	..	..	37	2	18	4	23 <sup>c</sup>	20	..	2	1	2	1		3	8	
18	Total, ..	1	1	8	6	8	80	65	2	1	4	2	2	180	22	124	26	96	146	13	2	1	13	21		42	17	12

<sup>a</sup> Hospital Sergeant.

<sup>b</sup> Hospital Orderly.

<sup>c</sup> Including 3 Jemadars.

<sup>d</sup> Including 1 Tindal.

An additional Non-Commissioned Officer to be allowed in the Field as Conductor of Stores.

TABLE shewing the difference between the Present Establishment of Field Batteries of the Royal Artillery, and that proposed by the Committee for Indian Service.

	Staff Sergeants.	Sergeants.	Corporals.	Bombardiers.	Gunners.	Drivers.	Trumpeters.	Farriers.	Shoeing Smiths.	Collar Makers.	Whealers.	Horses.	Jemadars of Syces.	Syces.	Grasscutters.	Tindal.	Store Lascars.	Bheestics.	Sweepers.	Bullock Drivers.
Present Establishment, ...	2	8	9	9	100	70	2	1	6	3	2	142	71	142	1	6	2	1	3	
Proposed Establishment,	2	8	6	8	80	65	2	1	4	2	2	146	3	93	146	1	12	2	1	3
Decrease, ... ..			3	1	20	5			2	1										
Increase, ... ..												4	3	22	4	1	6			

DECREASE.				INCREASE.					
		R.	A. P.			R.	A. P.		
3	Corporals,	80	13	0	4	Horses' Head and Heel Ropes,	8	0	0
1	Bombardier,	24	7	10	3	Jemadars of Syces,	21	0	0
2	Shoeing Smiths,	52	0	8	22	Syces,	88	0	0
1	Collar Maker,	22	15	4	4	Grasscutters,	14	0	0
25	Gunners and Drivers.	344	6	5	1	Tindal,	7	8	0
32	Rations,	200	0	0	6	Store Lascars,	36	0	0
	Head money,	8	0	0		Saving to Public, a	558	3	3
	Total,	732	11	3		Total,	732	11	3

a For a Month of 30 days.

**PROPOSED DETAIL FOR A RESERVE OR GARRISON BATTERY OF ARTILLERY, TO WHICH A HEAVY FIELD BATTERY IS LIABLE TO BE ATTACHED.**

1 First Captain.	}	6 Sergeants.
1 Second Captain.		4 Corporals.
3 Lieutenants. (one on 2nd Lieuts. Pay.)		6 Bombardiers.
1 Assistant Surgeon.		110 Gunners and Drivers.
1 Serjeant Major.		2 Trumpeters (1 acting).
1 Quarter Master Sergeant.		

When attached to a Heavy Battery, Artificers to be added in the same proportion as for a Light Field Battery, with the exception of shoeing Smiths, for which 2 jobbing Smiths should be substituted.

Five (5) Horses also to be added when attached to a Heavy Battery, for the Serjeant Major, Quarter Master Serjeant, Cattle Serjeant and two trumpeters; a Syce and Grasscutter for each horse.

**NATIVE ESTABLISHMENT.**

1 Tindal.	} 12 when attached to a Heavy Battery.	} 2 Bheesties. When attached to a Heavy Battery.
6 Store Lasca <sup>rs</sup> .		

The Committee refrain from making any suggestions as to the Ordnance or Carriages, Bullocks or Elephants, of this Battery, knowing that the subject has been under the consideration of the Ordnance Select Committee of Bengal, by order of the Commander-in-Chief and that their report has already been forwarded to Head Quarters.

In the following Tables, the Hospital Establishments have, in a great measure, been omitted, as well as the Native Establishment for the service of the European Soldiers; there may possibly also be some other trifling omissions and inaccuracies, but the results are a sufficient approximation to the actual cost, to enable a comparison to be drawn between the expense of Batteries in the several Services.

The rates of pay of certain classes of Natives vary in the different Presidencies, but the Committee, not being aware

of the reasons for such differences, do not interfere with these local arrangements; they would, however, recommend an increase to the pay of Syces and Grasscutters in the Bengal Presidency, in consequence of the difficulty of retaining the services of these men at the present rates, especially in the Punjab and stations above Delhi. The great demand for labor at this moment throughout the country in the construction of railways, and the high wages given, as well as the increased price of provisions, is an additional reason for increasing the pay of these people, in order to keep them in the Service. At the present moment in many places, the Grasscutters can make more than the amount of their wages, by cutting grass on their own account, and selling it in the bazaars.

It will also be observed in the tables, that the pay of one Trumpeter in each Battery, has been made the same as that of Bombardier, which at present is not the case, being in all except the Horse Artillery, only that of Gunner. The Committee however, trust that this recommendation will receive the approval of the Government, as there appears no reason for making any distinction in this respect in the two branches of the same Service. In the Royal Artillery, considerable inconvenience is experienced, especially in this Country, from the custom of posting Trumpeters to the ranks as soon as they are sufficiently tall and strong; they would otherwise be deprived of all chance of promotion in the service, but they are thus lost as Trumpeters, just as they become perfect and most useful in that capacity; it appears also not desirable that they should be so young as the boys who are frequently sent from England, being more likely to suffer from the climate than grown men, the Committee however think that by giving one Trumpeter in each Battery the rank and pay of Bombardier the services of the greater number of these men will be retained in their present capacities, and they consider the change will prove most beneficial to both Services.

TABLE showing the Expense to Government for a Month of 30 days, of a 6 Pounder Battery, Horse Artillery, as proposed by the Committee.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	A. P.	
1 Captain .. .. .	563	0 4	563	0 4	
1 Second Captain, .. .. .	563	0 4	563	0 4	
3 Lieutenants, .. .. .	365	4 0	1095	12 0	
1 Assistant Surgeon, .. .. .	365	4 0	365	4 0	
1 Sergeant Major, .. .. .	52	15 4	52	15 4	
1 Quarter Master Sergeant, .. .. .	52	15 4	52	15 4	
8 Sergeants, .. .. .	39	2 11	313	7 4	
6 Corporals, .. .. .	29	6 2	176	5 0	
8 Bombardiers, .. .. .	26	15 0	215	8 0	
80 Gunners, .. .. .	16	3 7	1297	14 8	
65 Drivers, .. .. .	13	12 5	895	7 1	
1 Trumpeter, .. .. .	26	15 0	26	15 0	
1 Acting Trumpeter, .. .. .	16	3 7	16	3 7	
1 Farrier, .. .. .	45	0 0	45	0 0	The expense of the Establishment of Artificers proposed for the Indian Artillery, is Rs. 26-8-0 per 30 days less than this.
4 Shoeing Smiths, .. .. .	28	7 6	113	14 0	
2 Collar Makers, .. .. .	25	6 6	50	13 0	
2 Wheelers, .. .. .	25	6 6	50	13 0	An additional Non-Commissioned Officer as Conductor of Stores, to be allowed when in the Field at Rs. 15 per month additional pay.
180 Rations at 5d., .. .. .			1125	0 0	
Hospital Sergeant, .. .. .			14	0 0	
Pay Sergeant for Battery Accounts, .. .. .			7	0 0	
Pay Sergt. for Savings' Bank Accounts, .. .. .			5	0 0	
Rough Rider, .. .. .			7	8 0	
Gunner as Hospital Orderly .. .. .			5	8 0	These rates per month,
Battery Command, .. .. .			30	0 0	
Repair of Arms, .. .. .			30	0 0	
Head money (185,) .. .. .			46	4 0	
Palanquin Allowance, .. .. .			30	0 0	
3 Jemadars of Syces, .. .. .	7	0 0	21	0 0	
119 Syces, .. .. .	4	0 0	476	0 6	
178 Grasscutters, .. .. .	3	8 0	623	0 0	
1 Tindal, .. .. .	7	8 0	7	8 0	
12 Store Lascars, .. .. .	6	0 0	72	0 0	
2 Bheasties, .. .. .	5	0 0	10	0 0	
1 Sweeper, .. .. .	4	0 0	4	0 0	
3 Bullock Drivers, .. .. .	5	0 0	15	0 0	
Total Rupees, .. .. .			8424	0 0	

The additional pay for School Master Sergeant has been omitted here, as it varies according to the number of scholars.

TABLE shewing the Expense to Government for a month of 30 days, of a 6 Pounder Battery, Bengal Horse Artillery, as proposed in the Proceedings of the Committee.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	A. P.	
1 Captain, .. .. .			563	0 4	
1 Second Captain, .. .			563	0 4	
3 Lieutenants, .. .	365	4 0	1095	12 0	
1 Assistant Surgeon, .. .			365	4 0	
1 Sergeant Major, .. .			53	11 8	
1 Quarter Master Sergeant, .. .			53	11 8	
7 Sergeants, .. .	39	12 1	278	4 7	
6 Corporals, .. .	29	13 1	178	14 6	
6 Bombardiers, .. .	27	5 4	164	0 0	
108 Gunners, .. .	16	7 4	1777	8 0	
1 Trumpeter, .. .			26	6 5	
1 Acting Trumpeter, .. .			16	7 4	
2 Half-pay Trumpeters, .. .	13	3 3	26	6 6	
1 Farrier, .. .			45	12 0	
2 Shoeing Smiths, .. .	28	7 6	56	15 0	
1 Collar Maker, .. .			25	6 6	
1 Wheeler, .. .			25	6 6	
138 Rations, at 5 <i>d.</i> , .. .			862	8 0	
Battery Command, .. .			30	0 0	
Repair of Arms, .. .			30	0 0	
Head money (143), .. .			35	12 0	
Palanquin Allowance, .. .			30	0 0	
Pay Sergeant, .. .			7	0 0	
Hospital Sergeant, .. .			14	11 1	
Hospital Orderly, .. .			6	0 0	
2 Rough Riders, .. .	7	7 3	14	14 6	
3 Jemadars of Syces, .. .	7	0 0	21	0 0	
170 Syces, .. .	4	0 0	680	0 0	
170 Grasscutters, .. .	3	8 0	595	0 0	
1 Tindal, .. .			7	8 0	
12 Store Lascars, .. .	6	0 0	72	0 0	
2 Bheesties, .. .	5	0 0	10	0 0	
3 Bullock Drivers, .. .	5	0 0	15	0 0	
1 Moochie, .. .			7	0 0	
1 Mistry Carpenter, .. .			14	0 0	
2 Workmen Carpenters, .. .	10	0 0	20	0 0	
2 Filemen, .. .	7	0 0	14	0 0	
2 Firemen, .. .	7	0 0	14	0 0	
2 Hammermen, .. .	6	0 0	12	0 0	
Total Rupees, .. .			7828	4 11	

These rates per month.



TABLE shewing the Expense of a 6 Pounder Troop, Horse Artillery, in the Madras Presidency for one Month.

ESTABLISHMENT.	Rates of Pay.			Total.			REMARKS.
	R.	A.	P.	R.	A.	P.	
1 Captain Commanding, .. .. .				563	0	4	
1 Second Captain, .. .. .				563	0	4	
3 Lieutenants, .. .. .	365	4	0	1095	12	0	
1 Assistant Surgeon, .. .. .				365	4	0	
1 Troop Quarter Master, .. .. .				191	7	0	
1 Sergeant Major, .. .. .				53	11	8	
1 Quarter Master Sergeant, .. .. .				53	11	8	
6 Sergeants, .. .. .	39	12	1	238	8	6	
6 Corporals, .. .. .	29	13	1	178	14	6	
12 Bombardiers, .. .. .	27	5	4	328	0	0	
1 Trumpeter, .. .. .				26	6	5	
1 2nd Trumpeter, .. .. .				16	7	4	
84 Gunners, .. .. .	16	7	4	1382	8	0	
3 Farriers, .. .. .	23	14	7	71	11	9	
1 Assistant Apothecary, .. .. .				70	0	0	
116 Rations at 5d, .. .. .				725	0	0	
Troop Command, .. .. .				50	0	0	
Orderly Sergeants, .. .. .				7	0	0	
Drill Corporals, .. .. .				7	0	0	
2 Rough Riders, .. .. .	7	7	3	14	14	6	
Head money for 115 Europeans, .. .. .				28	12	0	
1 Native Dresser, .. .. .				24	8	0	
3 Horsekeeper Chowdries, .. .. .	8	12	0	26	4	0	
3 Grasscutter Chowdries, .. .. .	8	12	0	26	4	0	
164 Horsekeepers, .. .. .	5	4	0	861	0	0	
164 Grasscutters, .. .. .	4	0	0	656	0	0	
1 Mistry, .. .. .				14	0	0	
2 Carpenters, .. .. .	10	2	4	20	4	8	
2 Armourers, .. .. .	10	2	4	20	4	8	
2 Smiths, .. .. .	10	2	4	20	4	8	
2 Hammermen, .. .. .	7	9	9	15	3	6	
2 Bellows Boys, .. .. .	2	8	7	5	1	2	
1 Chuckler, .. .. .				7	9	9	
Total Rupees, .. .. .				7707	14	6	

TABLE shewing the Expense to Government of a 6 Pounder Battery, Horse Artillery, in the Bombay Presidency, for one Month.

ESTABLISHMENT.	Rates of Pay.			Total.			REMARKS.
	R.	A.	P.	R.	A.	P.	
1 Captain, .. .. .				563	0	4	
1 Second Captain, .. .. .				563	0	4	
3 Lieutenants, .. .. .	365	4	0	1095	12	0	
1 Assistant Surgeon, .. .. .				365	4	0	
1 Sergeant Major, .. .. .				61	3	0	
1 Quarter Master Sergeant, .. .. .				53	11	8	
1 Riding Master Sergeant, .. .. .				54	10	7	
6 Sergeants, .. .. .	39	12	1	238	8	6	
6 Corporals, .. .. .	29	13	1	178	14	6	
10 Bombardiers, .. .. .	27	5	4	273	5	4	
123 Gunners, .. .. .	16	7	4	2024	6	0	
1 Trumpeter, .. .. .				26	6	5	
1 Acting Trumpeter, .. .. .				16	7	4	
2 Rough Riders, .. .. .	23	14	7	47	13	2	
2 Farriers, .. .. .	23	14	7	47	13	2	
1 Assistant Apothecary .. .. .				55	0	0	
155 Rations at 5d., .. .. .				968	12	0	For 30 days.
Troop Command, .. .. .				30	0	0	
Pay and Saddler Sergeant, .. .. .				14	0	0	
Savings' Bank Clerk, .. .. .				5	0	0	
Repair of Arms, .. .. .				30	0	0	
Head money 159 Europeans, .. .. .				39	12	0	
Head money 25 Natives, .. .. .				3	2	0	
Palanquin Allowance, .. .. .				30	0	0	
Veterinary Allowance for 200 Horses, .. .. .				24	14	0	
1 Havildar, Lascars, .. .. .				10	8	0	
24 Gun Lascars, .. .. .	7	0	0	168	0	0	
1 Native Farrier, .. .. .				21	0	0	
5 Watermen, .. .. .	7	8	0	37	8	0	
4 Muccadums of Horsekeepers, .. .. .	10	0	0	40	0	0	
123 Horsekeepers, .. .. .	6	0	0	768	0	0	
2 Sweepers, .. .. .	4	0	0	8	0	0	
1 Hulalcure, .. .. .				6	0	0	
1 Muccadum Grasscutter, .. .. .				10	0	0	
66 Grasscutters, .. .. .	5	0	0	330	0	0	
134 Allowances for Forage, .. .. .	4	0	0	536	0	0	
1 U. M. Carpenter, .. .. .				14	0	0	
1 U. M. Smith, .. .. .				14	0	0	
2 Carpenters, .. .. .	10	0	0	20	0	0	
2 Smiths, .. .. .	10	0	0	20	0	0	
2 Hammermen, .. .. .	7	8	0	15	0	0	
2 Bellows Boy, .. .. .	2	8	0	5	0	0	
4 Store Lascars, .. .. .	6	0	0	24	0	0	
Total Rupees, .. .. .				8857	12	5	

TABLE shewing the Expense to Government for a Month of 30 days, of a 9 Pounder Field Battery, as proposed by the Committee.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R	A. P.	
1 Captain .. . . .	493	10 0	493	10 0	} Including Horse Allowance Rs. 60 each.
1 Second Captain, .. . . .	478	11 6	478	11 6	
2 Lieutenants, .. . . .	295	12 0	591	8 0	} Including Horse Allowance Rs. 30 each.
1 Lieutenant on 2nd Lieutenants' Pay .. . . .	243	5 0	243	5 0	
1 Assistant Surgeon, .. . . .	295	12 0	295	12 0	
1 Sergeant Major, .. . . .	51	6 10	51	6 10	
1 Quarter Master Sergeant, .. . . .	51	6 10	51	6 10	
8 Sergeants, .. . . .	36	11 9	293	14 0	
6 Corporals, .. . . .	26	15 0	161	10 0	
8 Bombardiers, .. . . .	24	7 10	195	14 8	
80 Gunners, .. . . .	13	12 5	1102	1 4	
65 Drivers, .. . . .	13	12 5	895	7 1	
1 Trumpeter, .. . . .	24	7 10	24	7 10	
1 Acting Trumpeter, .. . . .	13	12 5	13	12 5	The expense of the Establishment of Artificers proposed for the Indian Artillery, is Rs. 14-7-10 less than this.
1 Farrier, .. . . .	42	8 10	42	8 10	
4 Shoeing Smiths, .. . . .	26	0 4	104	1 4	An extra Non-Commissioned Officer as Conductor of Stores, to be allowed when in the Field at Rs. 15 per month additional pay.
2 Collar Makers, .. . . .	22	15 4	45	14 8	
2 Wheelers, .. . . .	22	15 4	45	14 8	
180 Rations at 5d., .. . . .	1125	0 0	1125	0 0	
Battery Command, .. . . .	30	0 0	30	0 0	
Repair of Arms, .. . . .	30	0 0	30	0 0	These rates per month.
Head money (185), .. . . .	46	4 0	46	4 0	
Palanquin Allowance, .. . . .	30	0 0	30	0 0	
Hospital Sergeant, .. . . .	14	0 0	14	0 0	
Pay Sergeant for Battery Accounts, .. . . .	7	0 0	7	0 0	
Pay Sergt. for Savings' Bank Accounts, .. . . .	5	0 0	5	0 0	
Rough Rider, .. . . .	7	8 0	7	8 0	
Gunner as Hospital Orderly .. . . .	5	8 0	5	8 0	
3 Jemadars of Syces, .. . . .	7	0 0	21	0 0	
93 Syces, .. . . .	4	0 0	372	0 0	
146 Grasscutters, .. . . .	3	8 0	511	0 0	
1 Tindal, .. . . .	7	8 0	7	8 0	
12 Store Lascars, .. . . .	6	0 0	72	0 0	
2 Bheesties, .. . . .	5	0 0	10	0 0	
1 Sweeper, .. . . .	4	0 0	4	0 0	
3 Bullock Drivers, .. . . .	5	0 0	15	0 0	
Total Rupees, .. . . .	7444	3 0	7444	3 0	

The additional pay of School Master Sergeant has been omitted as it varies according to the number of attendants.

TABLE shewing the Expense to Government for a month of 30 days, of a 9 Pounder Field Battery, Bengal Artillery, European being substituted for Native Drivers.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	A. P.	
1 Captain, .. .. .			493	10 0	} Including Rs. 60 Horse Allowance each.
1 Second Captain, .. .			478	11 6	
2 Lieutenants, .. .	295	12 0	591	8 0	} Including Rs. 30 Horse Allowance each.
1 Lieutenant on lower pay, .. .			243	5 0	
1 Assistant Surgeon, .. .			295	12 0	
1 Sergeant Major, .. .			51	3 11	
1 Quarter Master Sergeant, .. .			51	3 11	
1 Rough Rider and Farrier Sergeant..			51	3 11	
1 Aast. Farrier and Saddler Sergeant. .			51	3 11	
6 Sergeants, .. .	37	4 4	223	10 0	
6 Corporals, .. .	27	5 4	164	0 0	
6 Bombardiers.. .	24	13 7	149	1 6	
60 Gunnere, ' .. .	13	15 7	838	7 0	
60 Drivers, .. .	13	15 7	838	7 0	Substituted for Syce Drivers.
2 Buglers, .. .	13	15 7	27	15 2	
2 Half-pay-Buglers, .. .	9	1 4	18	2 8	
146 Rations, at 5d., .. .			912	8 0	
Battery Command, .. .			30	0 0	
Repair of Arms &c., .. .			30	0 0	
Pay Sergeant, .. .			7	0 0	
Head money (151), .. .			37	12 0	
1 Havildar, .. .			9	8 0	
2 Naicks, .. .	8	0 0	16	0 0	
24 Gun Lascars, .. .	5	12 0	138	0 0	
130 Syces, .. .	4	0 0	520	0 0	
130 Grasscutters, .. .	3	8 0	455	0 0	
1 Bheestie, .. .			5	0 0	
1 Native Farrier, .. .			9	0 0	
1 Mochie, .. .			8	0 0	
1 Mistry Smith, .. .			12	0 0	
2 Filemen, .. .	7	0 0	14	0 0	
2 Firemen, .. .	7	0 0	14	0 0	
2 Hammermen, .. .	6	0 0	12	0 0	
1 Mistry Carpenter, .. .			14	0 0	
2 Workmen Carpenters, .. .	10	0 0	20	0 0	
3 Bullock Drivers, .. .	5	0 0	15	0 0	
4 Bildars, .. .	3	8 0	14	0 0	
1 Lascar, .. .			5	12 0	
<b>Total Rupees, .. .</b>			<b>6723</b>	<b>5 6</b>	

TABLE shewing the Expense to Government of a 9 Pounder Field Battery, in the Madras Presidency for one Month

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	A. P.	
1 Captain, .. .. .			493	10 0	Horse Allowance, 60 Rs. each.
1 Second Captain, .. .. .			478	11 6	
2 Lieutenants, .. .. .	295	12 0	591	8 0	Horse Allowance, 30 Rs. each.
1 Lieutenant on lower pay, .. .. .			243	5 0	
1 Assistant Surgeon, .. .. .			293	13 0	
1 Staff Sergeant .. .. .			51	3 11	
1 Staff Sergeant .. .. .			44	11 7	
9 Sergeants, .. .. .	37	4 4	335	7 0	
9 Corporals, .. .. .	27	5 4	246	0 0	
6 Bombardiers, .. .. .	24	13 7	149	1 6	
60 Gunners, .. .. .	13	15 7	838	7 0	
60 Drivers, .. .. .	13	15 7	838	7 0	
2 Buglers, .. .. .	13	15 7	27	15 2	
2 Half-pay-Buglers, .. .. .	6	5 10	12	11 8	
3 Farriers, .. .. .	21	6 10	64	4 6	
1 Assistant Apothecary, .. .. .			70	0 0	
154 Rations, at 6d., .. .. .			962	8 0	
Command Allowance, .. .. .			30	0 0	
Repair of Arms &c., .. .. .			30	0 0	
Orderly Sergeant, .. .. .			7	0 6	
Head money, 25 Rs. per 100 .. .. .			38	4 0	
Head money (Natives), .. .. .			4	2 0	
1 Horsekeeper Chowdry, .. .. .			8	12 0	
1 Grasscutter Chowdry, .. .. .			8	12 0	
130 Horsekeepers, .. .. .	5	4 0	682	8 0	
130 Grasscutters, .. .. .	4	0 0	520	0 0	
1 Puckally, .. .. .			10	11 10	
1 Moochie, .. .. .			7	9 9	
1 Mistry, .. .. .			14	0 0	
2 Carpenters, .. .. .	10	2 4	20	4 8	
2 Amourers, .. .. .	10	2 4	20	4 8	
2 Smiths, .. .. .	10	2 4	20	4 8	
2 Hammermen, .. .. .	7	9 9	15	3 6	
2 Bellows Boys, .. .. .	2	8 7	5	1 2	
1 Chuckler, .. .. .			7	9 9	
1 Jemadar, .. .. .			17	8 0	
2 Havildars, .. .. .	9	13 4	19	10 8	
30 Gun Lascars, .. .. .	7	0 0	210	0 0	
1 Bheestie, .. .. .			7	0 0	
Total Rupees, .. .. .			7448	6 8	

TABLE shewing the Expense to Government for one Month of a 9 Pounder Field Battery, Bombay Artillery.

ESTABLISHMENT.	Rates of Pay.		Total.			REMARKS.
	R.	A. P.	R.	A.	P.	
1 Captain, .. .. .	..	..	493	10	0	} Including Rs. 60 Horse Allowance each.
1 Second Captain, .. .	..	..	478	11	6	
2 Lieutenants, .. .	295	12 0	591	8	0	} Including Rs. 30 Horse Allowance each.
1 Lieutenant, lower pay, .. .	..	..	243	5	0	
1 Assistant Surgeon, .. .	..	..	295	12	0	
1 Brigade Sergeant, .. .	..	..	51	4	0	
1 Battery Staff Sergeant, .. .	..	..	44	11	7	
8 Sergeants, .. .	37	4 4	298	2	8	
6 Corporals, .. .	27	5 4	164	0	0	
9 Bombardiers, .. .	24	13 7	223	10	3	
159 Gunners, .. .	13	15 7	2221	13	9	
2 Trumpeters, .. .	13	15 7	27	15	2	
1 Farrier, .. .	..	..	21	6	10	
187 Rations at 5d., .. .	..	..	1168	12	0	
Command Allowance, .. .	..	..	30	0	0	
Repair of Arms, &c., .. .	..	..	30	0	0	
Pay Sergeant, .. .	..	..	7	0	0	
Ditto Savings' Bank .. .	..	..	5	0	0	
Head money 192 Europeans, .. .	..	..	48	0	0	
Head money Natives, .. .	..	..	3	14	0	
Veterinary Allowance, .. .	..	..	17	2	8	
1 Havildar, .. .	..	..	10	8	0	
30 Gun Lascars, .. .	7	0 0	210	0	0	
5 Watermen, .. .	7	8 0	37	8	0	
1 Native Farrier, .. .	..	..	21	0	0	
1 Moochie, .. .	..	..	10	8	0	
2 Muccadums of Syces, .. .	10	0 0	20	0	0	
99 Syces, .. .	6	0 0	594	0	0	
2 Sweepers, .. .	4	0 0	8	0	0	
1 Hualcore, .. .	..	..	6	0	0	
1 Maistry Carpenter, .. .	..	..	14	0	0	
1 Maistry Smith, .. .	..	..	14	0	0	
2 Carpenters, .. .	10	0 0	20	0	0	
2 Smiths, .. .	10	0 0	20	0	0	
2 Hammermen, .. .	7	8 0	15	0	0	
2 Bellows Boys, .. .	2	8 0	5	0	0	
4 Store Lascars, .. .	6	0 0	24	0	0	
46 Grasscutters, .. .	5	0 0	230	0	0	
1 Muccadum of Grasscutter, .. .	..	..	10	0	0	
92 { Allowances for Grass in lieu of } Grasscutters, .. .	4	0 0	368	0	0	
Total Rupees, .. .	..	..	8163	3	5	

TABLE showing the Expense for 30 days, of a Reserve or Garrison Battery, to which a Heavy Field Battery is liable to be attached, as proposed by the Committee.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	P.	
1 Captain, .. .. .			433	10 0	When attached to a Heavy Field Battery, Horse Allowance to be granted at the same rates as with Light Field Batteries.
1 Second Captain, .. .. .			418	11 6	
2 Lieutenants, .. .. .	265	12 0	531	8 0	
1 Lieutenant on 2nd Lieutenants' Pay, .. . . .			213	5 0	
1 Assistant Surgeon, .. .. .			265	12 0	
1 Sergeant Major, .. .. .			51	6 10	
1 Quarter Master Sergeant, .. .. .			51	6 10	
6 Sergeants, .. .. .	36	11 9	220	6 6	
4 Corporals, .. .. .	26	15 0	107	12 0	
6 Bombardiers, .. .. .	24	7 10	146	15 0	
110 Gunners, .. .. .	13	12 5	1515	5 10	
1 Trumpeter, .. .. .			24	7 10	
1 Acting Trumpeter, .. .. .			13	12 5	
130 Rations at 5d., .. .. .			812	8 0	
Command Allowance .. .. .			30	0 0	
Repair of Arms, .. .. .			30	0 0	
Hospital Sergeant, .. .. .			14	0 0	
Hospital Orderly, .. .. .			5	8 0	
Pay Sergeant, .. .. .			7	0 0	
Do. for Savings' Bank, .. .. .			5	0 0	
Head money, .. .. .			32	8 0	
Palanquin Allowance, .. .. .			30	0 0	
Total Rupees .. .. .			4960	15 9	

TABLE shewing the Expense to Government for a Month of 30 days, of a Reserve Company, Bengal Artillery.

ESTABLISHMENT.	Rates of Pay.			Total.			REMARKS.
	R.	A.	P.	R.	A.	P.	
1 Captain, .. .. .				433	10	0	
1 Second Captain, .. .. .				418	11	6	
2 Lieutenants, .. .. .	265	12	0	531	8	0	
1 Lieutenant on lower pay, .. .. .				213	5	0	
1 Assistant Surgeon, .. .. .				265	12	0	
1 Sergeant Major, .. .. .				51	3	11	
6 Sergeants, .. .. .	37	4	4	223	10	0	
6 Corporals, .. .. .	27	5	4	164	0	0	
6 Bombardiers, .. .. .	24	13	7	149	1	6	
2 Buglers, .. .. .	13	15	7	27	15	2	
2 Half-pay Buglers, .. .. .	9	1	4	18	2	8	
60 Gunners, .. .. .	13	15	7	838	7	0	
83 Rations at 5d., .. .. .				518	12	0	
Command Allowance, .. .. .				30	0	0	
Repair of Arms, &c., .. .. .				30	0	0	
Pay Sergeant, .. .. .				7	0	0	
Head money (88), .. .. .				22	0	0	
Palanquin Allowance, .. .. .				30	0	0	
1 Jemadar, .. .. .				22	8	0	
2 Havildars, .. .. .	9	8	0	19	0	0	
2 Naicks, .. .. .	8	0	0	16	0	0	
31 Gun Lascars, .. .. .	5	12	0	178	4	0	
Total Rupees, .. .. .				4208	14	9	



TABLE showing the Expense to Government of a Reserve or Garrison Company,  
Bombay Artillery, for one Month.

ESTABLISHMENT.	Rates of Pay.		Total.		REMARKS.
	R.	A. P.	R.	A. P.	
1 Captain, .. .. .			433	10 0	
1 Second Captain, .. .. .			418	11 6	
2 Lieutenants, .. .. .	265	12 0	531	8 0	
1 Lieutenant, on lower pay, .. .. .			213	5 0	
1 Assistant Surgeon, .. .. .			265	12 0	
1 Staff Sergeant, .. .. .			51	4 0	
4 Sergeants, .. .. .	37	4 4	149	1 4	
5 Corporals, .. .. .	27	5 4	136	10 8	
10 Bombardiers, .. .. .	24	13 7	248	7 10	
80 Gunners, .. .. .	13	15 7	1117	14 8	
2 Buglers, .. .. .	13	15 7	27	15 2	
1 Half-pay Bugler, .. .. .			6	15 9	
103 Rations at 5d., .. .. .			643	12 0	
Command Allowance, .. .. .			30	0 0	
Repair of Arms, &c., .. .. .			30	0 0	
Pay Sergeant, .. .. .			7	0 0	
Savings' Bank Clerk, .. .. .			5	0 0	
1 Subadar, .. .. .			24	8 0	
2 Havildars, .. .. .	10	8 0	21	0 0	
80 Gun Lascars, .. .. .	7	0 0	210	0 0	
1 Gun Lascar Boy, .. .. .			3	8 0	
4 Bhoestics, .. .. .	7	8 0	30	0 0	
1 Sweeper, .. .. .			4	0 0	
Total Rupees, .. .. .			4610	1 11	

TABLE shewing the Expense incurred by Government for the Pay and Subsistence of the European Artillery, as now existing in India, upon the present authorized Establishments, and of the same number and description of Batteries, organized according to the Details proposed by the Committee.

	Number of Batteries.	Rate per Month.		Total.		Grand Total.			
		R.	A. P.	R.	A. P.	R.	A. P.	R.	A. P.
<b>PRESENT ESTABLISHMENT.</b>									
<i>Royal.</i>									
Horse Artillery,.....	4	8,925	0 0	35,700	0 0				
Field Batteries,.....	20	8,001	0 0	1,60,020	0 0	1,95,720	0 0		
<i>Bengal.</i>									
Horse Artillery,.....	13	7,828	0 0	1,01,764	0 0				
Field Batteries,.....	14	6,723	0 0	94,122	0 0				
Reserve Companies,.....	10	4,208	0 0	42,080	0 0	2,37,966	0 0		
<i>Madras.</i>									
Horse Artillery,.....	4	7,707	0 0	30,828	0 0				
Field Batteries,.....	11	7,448	0 0	81,928	0 0				
Reserve Companies,.....	5	4,254	0 0	22,270	0 0	1,35,026	0 0		
<i>Bombay.</i>									
Horse Artillery,.....	4	8,857	0 0	34,428	0 0				
Field Batteries,.....	11	8,103	0 0	89,113	0 0				
Reserve Companies,.....	1	4,610	0 0	4,610	0 0	1,28,151	0 0		
<b>Total Expense of present Establishments,</b>								6,96,863	0 0
<b>PROPOSED ESTABLISHMENT.</b>									
Horse Artillery,.....	25	8,424	0 0	2,10,600	0 0				
Field Batteries,.....	56	7,444	0 0	4,16,864	0 0				
Reserve Companies,.....	16	4,960	0 0	79,360	0 0	7,06,824	0 0		
<b>Total Expense of proposed Establishment,</b>								7,06,824	0 0
<b>Difference,</b>								9,961	0 0

The Committee have had under their consideration, by order of the Right Honorable Lord Clyde, Commander-in-Chief, a letter from the Acting Secretary to Government Military Department, Madras Presidency, with, a proposal for placing the Royal Artillery in India on a Peace establishment, but the Committee, after mature deliberation, are of opinion that the details proposed in this paper are objectionable, and see no reason for making any alteration in the establishments already recommended in their Proceedings.

*Vide Appendix*

In the details proposed in the paper before the Committee, a 6 Pounder Waggon in a Battery of Horse Artillery is allowed but four horses, while a 9 Pounder Waggon in a Field Battery is allowed six; the difference in weight is but trifling in these Carriages, and there can be no reason for reducing the horses of the former to such an extent, especially as Horse Artillery may be required to move more rapidly and to make longer marches; and the Committee consider four horses utterly insufficient under any circumstances. The Forge Waggon of the 9 Pounder Battery is allowed six horses, whereas that of the 6 Pounder Battery has but four; the weights are the same, the Carriages being identical, and the latter may have to do the hardest work. The same applies to the Store Limber Waggon. This in the opinion of the Committee is a proof that the number of horses as proposed in the details is insufficient, and any alteration in the number of horses of a team necessitates a change in the men, both European and Native.

The Details appear to the Committee in other respects also objectionable, and with every regard for economy, they regret they cannot recommend for adoption the scale laid down by the Authorities at Madras.

As regards the strength of Brigades or Battalions of Artillery, the Committee do not feel it necessary nor even desirable to enter fully into this question, as it is one which

must be affected by any change in the organization of the Army, a subject now under the consideration of the Home Government. They consider, however, that the Service will be benefitted by an alteration in the Staff, and especially in the Non-Commissioned Staff of Brigades and Battalions, and the transfer of some of these men to the Depôts of Instruction.

Each Brigade of Horse Artillery of four Troops has at present the following Brigade Staff, viz :—

1 Adjutant and Quarter Master.	1 Orderly Room Clerk.
1 Surgeon.	1 Drill Serjeant.
1 Assistant Surgeon.	1 Hospital Serjeant.
1 Veterinary Surgeon.	1 Rough Rider Serjeant.
1 Riding Master.	1 Farrier Major.
1 Serjeant Major.	1 Trumpet Major.
1 Quarter Master Serjeant.	1 Drill Corporal.
1 School Master Serjeant.	

Each Battalion of Artillery of four Companies has a Battalion Staff of :—

1 Adjutant and Quarter Master.	1 Hospital Serjeant.
1 Surgeon.	1 School Master Serjeant.
1 Assistant Surgeon.	1 Drill Corporal.
1 Serjeant Major.	1 Bugle Major.
1 Quarter Master Serjeant.	1 Orderly Room Clerk.
1 Drill Serjeant.	1 Librarian.

The Committee would recommend the retention of the Adjutant and Quarter Master, and the Surgeon, but having already proposed one Assistant Surgeon for each Battery, it is of course unnecessary to add another for the Brigade Staff; one Veterinary Surgeon has also been proposed for at least every two Batteries (horsed), another for the Staff is therefore quite superfluous. The Riding Masters the Committee would recommend being transferred from the Brigade Staff to the Depôts of Instruction, where their services would be much

more useful. The Committee further recommend that the Non-Commissioned Staff of each Brigade and Battalion should consist of one Sergeant Major, one Quarter Master Sergeant, and one Orderly Room Clerk. The Hospital Sergeants and School Master Sergeants are unnecessary with the Staff of Brigades, as each Battery is recommended to have its own Hospital Establishment and its own school; the School Master Sergeant might also act as Librarian when necessary. Rough Riders and Farriers are proposed for each Battery, and the Rough Rider Sergeants and Farrier Majors are quite unnecessary with the Brigade Staff, they might therefore be transferred to the Depôts of Instruction until absorbed. The Drill Sergeants and Corporals, and Trumpet and Bugle Majors should in like manner be transferred to the Depôts.

If, however, from the size of any Division of Artillery at a station where several Batteries are assembled together, it should be found expedient to increase the Non-Commissioned Staff of the Brigade or Battalion at that place, the Committee recommend that the Commandant of Artillery be empowered to detach such Non-Commissioned Staff Officers from the Depôt for duty in such Division.

The Committee consider that, in the distribution of Batteries throughout the various stations, great advantage will be derived by keeping those of the same Brigade as much together or as near to each other as possible.

### RECRUIT DEPOT.

The Committee recommend the following Establishment for a Recruit Depôt, but as the number of Recruits must of course differ considerably in the three Presidencies, it may be also necessary to make a difference in the strength of these Establishments, which the Committee would leave for the decision of the local authorities.

## FOR A DEPÔT OF 500 MEN.

1 Superintendent.	1 School Master Sergeant, also with Assistants (Non effective) in proportion to the number of men attending.
1 Second in Command.	
2 Lieutenants, and Assistant Instructors, one to be a passed Musketry Instructor.	1 Orderly Room Clerk.
1 Adjutant.	1 Master Tailor.
1 Quarter Master.	1 Trumpet and Bugle Major.
1 Sergeant Major.	1 Second Trumpet and Bugle Major.
1 Quarter Master Sergeant.	5 Drill Sergeants.
1 Pay Sergeant, with Assistants (Non-effective) in the proportion of one to every additional 100 recruits above the number of 200.	5 Drill Corporals.
	1 Armourer Sergeant.

*Riding Establishment.*

1 Riding Master, (Captain).	20 Rough Riders, to furnish Rough Riders to Batteries.
1 Riding Master, (Lieutenant).	
1 Sergeant Major.	1 Farrier.
3 Sergeants.	200 Horses, with two Syces for every 3 Horses, and 1 Grass-cutter for each.
3 Corporals.	

Officers and Men belonging to this Establishment to receive Horse Artillery pay, and to be distinct from the Recruit Depot.

The Committee in laying down this Establishment for Recruit Depots, cannot refrain from recording their opinion as to the great advantages which would be derived from the organization of a general Recruit Depot for the Artilleries of the three Presidencies in England.

Without taking upon themselves to enter into the details necessary for carrying out such a plan, they would point out that, looking to the probable future scale of the Local European Forces, the present establishment at Warley will be manifestly inadequate to meet the requirements of the Service, and it appears therefore a favorable opportunity for the establishment of a distinct Depot for the Artillery.

The *locale* for such Depot would of course be for the consideration of the Home Authorities, and necessarily be decided by circumstances on which the Committee do not feel competent to enter. They cannot however conceive any place where its purposes would be so adequately fulfilled as Woolwich, where every facility is afforded, and all means present themselves for the full professional instruction of Artillery Recruits in every branch of the Service.

This Depot, on a scale calculated at the rate of 10 per cent. of the whole strength of the Indian Artilleries, should, the Committee consider, have a permanent Staff composed of Officers of the Indian Artillery, and a certain number of Officers at Home on furlough or Medical Certificate should be appointed to do duty with it.

In the same manner, besides a permanent Staff of Non-Commissioned Officers, all Non-Commissioned Officers in England on furlough should, after visiting their homes, be appointed to do duty with the Depot. These last, together with the Officers temporarily attached as above, would be available to take charge of and accompany the various draughts to India. The recruits on landing would at once join their several Troops and Companies as trained soldiers, and the Indian Depots as a consequence be abolished.

Should the recommendation thus offered by the Committee be approved and carried into effect, they would desire further to remark on the advantages which would be derived from assembling at the respective Head Quarters of the three Presidencies, a larger proportion of Troops and Batteries than, speaking more particularly in regard to Meerut, the limited barrack accommodation now admits of. The Committee cannot too strongly express themselves on this point, being convinced that nothing is more beneficial to the Service than massing and working Batteries together; and the oftener the different portions of a Regiment can be brought in course of relief to Regimental Head Quarters, the more

certainly will uniformity in equipments, drill, discipline, and interior economy prevail and be maintained.

The barracks now occupied by Recruit Depots may be made use of in this manner with the greatest advantage.

### CONTRACTS.

Opinions have been gathered from various quarters as to the advantages or disadvantages of the Contract System, as adopted in the Indian Artillery, and the Store System existing in the Royal Artillery; and the Committee recommend the continuance of the former system in the Indian Service, and that it also be extended to the Royal Artillery serving in this country. As however there appears to be some difference in the systems adopted in the three Presidencies and that in Madras, it only partially exists, the Committee consider it desirable that certain rules should be laid down in order to ensure uniformity throughout India in this respect. At the same time they do not think it advisable to interfere with the rates of allowance, which vary in the different Presidencies, not being aware of the reasons which have guided the Government in laying down the existing scales. In the Madras Presidency it appears the Officer Commanding the Brigade of Horse Artillery, and of a Battalion with Horse Field Batteries attached, has a direct interest in the Contract Allowances, a certain portion only of which is received by the Officer Commanding the Battery itself, but as this latter Officer is, or ought to be, in every way responsible that his equipment is maintained at all times in a state of efficiency, it is contended that he should receive the whole of the Contract Allowances.

#### MINUTE BY COLONEL SIR GEORGE BARKER ON THE CONTRACT SYSTEM.

The Contract System for the repair of Carriages, Harness, &c., is in my opinion so objectionable, and so strongly do I feel opposed to it, that I cannot refrain from recording my



dissent from the recommendation of the Committee in this respect. It is certainly unadvisable to place the pecuniary interests of individuals and the efficiency of the Service in opposition to each other; the reasons scarcely require explanation. The stores of every description to accompany a Battery on Service cannot be too minutely detailed, and should be supplied from Government Magazines, and of a certain quality. Even with the Contract System, I consider the Ordnance Commissaries, when in the field, should be provided with all material and stores requisite for the Artillery, and if this is done, where is the advantage of the system?—the Service should be secured from the accident of insufficient supplies, from whatever cause it may be likely to arise. On the occasion of Troops being employed away from their own immediate territory, I believe the Ordnance Department have been often called upon to supply whatever has been required by Officers Commanding Batteries, who were allowed to purchase such articles from the Government. This shows that the system is not at all times applicable, and that it is after all necessary, under certain circumstances, to have recourse to the Store System.

It would also appear from this, and I believe such was originally the intention, that the present Contract Allowances were granted with a view, not only to keep the carriages and equipment in repair, but also to remunerate the Captains for the labor and responsibility of their commands. The discontinuance of the Contract System would cause a very serious pecuniary loss to Captains of Batteries, and I submit that an equivalent should be given in the shape of Command pay, in the event of this system being abolished. I also submit, with due deference, that Officers Commanding Batteries are at present unequally paid, as compared with Commanding Officers of Regiments. Their commands are independent and most important, and although perhaps numerically inferior, the responsibility and labor, from the mixed nature of their duties, the number of carriages and the amount of

stores in their charge, equally great, while at the same time the assistance they receive, owing to the small number of Officers and the absence of Staff, is very trifling. I object, however, to this indirect way of remunerating Officers for their services, through the Contract Allowances, and I conceive they would be placed in a better and more fitting position by the grant of Command pay of 300 Rupees a month.

As compared with Officers Commanding Regiments of Irregular Cavalry, Captains of Batteries are still more unequally paid. There can be no question as to the comparative importance of the two commands, or the labor and responsibility attending them, and while of the same rank in the Service, the lowest rate of Command pay granted to the Officer of Cavalry is upwards of 500 Rupees per month, and in case of his being a Lieutenant, he receives upwards of 700 per month for his command.

I think also that with the Contract System, the younger Officers are less likely to be instructed in certain minute details of their duties, and made less responsible for the complete efficiency of the equipment of their Divisions, than is now the custom in the Royal Artillery, as the Captain would, for the sake of his own purse, take more personal management of everything connected with material repairs.

The best argument in favour of the continuance of the Contract System in this country, is that the introduction of the Store System would involve the necessity of a total change in the Ordnance Departments and in the management of the Magazines, and it might even be necessary to send out gentlemen of the Ordnance Commissariat at home, until the Store System was properly established in India. This, however, in my opinion, would be an advantage rather than other-

wise; but while expressing this opinion, I must disclaim all intention of underrating the services of the Commissaries of Ordnance in this country, a most able and valuable set of Officers, and I have ever found them willing and anxious to further the interest of the Service in every way.

Whatever system it may eventually be considered by the Government desirable to adopt, I trust that orders will be speedily issued upon the subject, for it has become absolutely necessary that uniformity should exist in this respect, not only for the sake of the Officers Commanding Batteries of the Royal Artillery, but to prevent the confusion and occasional waste of Stores which must take place while two distinct systems prevail in the same Magazines.

The Officers Commanding Batteries of Royal Artillery are frequently put to the greatest inconvenience from the delay which takes place in the issue of stores, and to considerable annoyance from the difficulty of passing their Contingent Bills through the Office of the Military Auditor General, notwithstanding the orders of Government on the subject. The Contingent Bills should not require audit, but be passed and paid on the spot, upon the signature of the Commanding Officer of Artillery at the Station. In case of the Bills of any Battery appearing unusually or unreasonably high, attention should be called that it may be checked in future; but as the Officer Commanding the Battery has actually himself paid the money for the service of the Government, I contend that the Military Auditor General is not right in refusing or withholding its repayment. The Officer Commanding the Artillery on the spot is the best and only judge of the expenditure being necessary for the service, and his signature should be sufficient.

GEO. R. BARKER, Colonel, Royal Artillery,  
and President.

MINUTE BY LIEUTENANT COLONEL PRICE, ROYAL HORSE  
ARTILLERY.

I dissent from the President "that the pecuniary interest of individuals and the efficiency of the Service are in opposition to each other." I maintain they are identical, as I cannot believe that any Officer in Command of a Troop of Horse Artillery or Field Battery, Heavy or Light, can possibly be so short sighted to his own interest as to permit any portion of his equipment to continue out of repair.

It is well known that if you use a wheel that requires setting up, without at once taking it in hand, in all probability the whole wheel will become unserviceable, and the Captain will then have to pay for a new wheel, whereas a few annas for fuel, if expended in time, would have saved the Officer many rupees. The old saying of "a stitch in time saves nine," applies in the fullest sense to the harness and equipment of Batteries of Artillery; and the only way that I can see for a Captain of a Battery to allow the interest of his pocket to interfere with the interest of the Service, is by his not taking out his Battery to drill as often as the good of the Service may require, but I doubt much that natural indolence may not be the cause of this neglect, if it does occur; and if Captains Commanding Batteries, when detached, had to send in a monthly diary of parades to the Head Quarters of their Brigade, Battalion, or Division, the Officer Commanding the Brigade, Battalion, or Division, could easily take steps to keep any Captain who neglected his drills up to his work.

I consider that each Battery should be inspected by a Lieutenant Colonel of Artillery at least once every year, which at present is not the custom in Bengal, where it is not usual for a Troop or Battery to be inspected by a Regimental Field Officer, when it does not belong to any Artillery Division.

I do not at all wish to continue the Contract System, if the Store System can be brought to act, but as it is now carried on in India, I am certain that it is not only the most expensive, but also the most troublesome and vexatious that can be devised. Captains of the Royal Artillery are now often kept months and months without receiving articles indented for, but though the indented articles are not received, large quantities of blankets, traces, harness, &c., have been sent from the Magazines without having been demanded, and which, as there is no storage for such surplus articles, are only an encumbrance, and if the Battery went on service could not be taken with it.

The Military Auditor General's Office is also a severe drag on the system in the Royal Artillery. Months and months pass without Contingent Bills for repairs being audited, and when perhaps the First and Second Captains, and a portion or all of the Subalterns have been promoted or removed by sickness, or some other cause, from the Battery, back comes a disallowance from the Military Auditor General against the Battery for some hundreds of rupees, which causes the greatest inconvenience, though eventually the bill is passed, as passed it must be, the money having been *bona fide* expended for the good of the Service.

E. PRICE, Lieut.-Colonel, Royal Horse Artillery.

I full concur with Colonel Price.

A. M. CALVERT, Captain.

#### FIELD ORDNANCE.

With regard to paragraph 5 of the Instructions, the Committee are of opinion that the Light 9 Pounder Gun (10 cwt.) of the Indian Service is sufficient for Field Artillery purposes in this country; and although the Committee admit that the Light 24 Pounder Howitzer is, as compared with

that used by the Royal Artillery, an indifferent piece of Ordnance, yet as it is desirable that the Howitzer to be associated with the Light 9 Pounder Gun in the same Battery, should be as nearly as possible of the same weight, it becomes necessary to adopt this Light 24 Pounder Howitzer as well, especially as a change would cause great expense; and while more extensive and more important changes in the arming of Artillery are under contemplation at home, by which the Service in India will probably also be shortly affected, it is not expedient to make any other alterations in the Ordnance,

The Committee however consider that it may be advisable to keep in reserve at each of the Arsenals at Fort William, Fort George, and at Bombay, certain Batteries of the medium 9 Pounder Gun and 24 Pounder Howitzer, for the use of the Royal Artillery in the event of their being required for service away from India, where they would be likely to have to contend against heavier metal.

The Committee recommend that all 9 Pounder and 6 Pounder Guns be cast with a dispart patch.

#### PRICE OF SHOT, SHELL, ORDNANCE, ETC.

The Committee beg to submit for the information of Government the following Statement, showing the cost of Shot, Shell, &c., and Brass and Iron Ordnance, manufactured in the Royal Arsenal at Woolwich, and of the same articles in India, whether manufactured at the Foundry at Cossipore or procured from contractors in England. It will be seen that a very great saving may be effected by procuring these things from the Government manufactory at home, instead of contractors. With regard to the Brass Ordnance, although the Committee do not recommend any diminution in the Establishment of the Government Foundries in India, it will

be seen by the annexed Table that the difference in the cost of these Ordnance in the two countries is very great.

	10 Inch.			25 Pdr.			36 Pdr.			18 Pdr.			9 Pdr.			6 Pdr.					
	R.	A.	P.	R.	A.	P.	R.	A.	P.	R.	A.	P.	R.	A.	P.	R.	A.	P.			
100 Common Shell from Arsenal, Woolwich, riveted, plugged, and boxed,	341	0	5	145	4	8	87	11	6	76	2	4	.....	.....	.....	.....	.....	.....			
100 Common Shell in India, fixed, .....	1182	8	0	531	4	0	538	2	0	491	4	0	.....	.....	.....	.....	.....	.....			
100 Diaphragm Shell from the Arsenal, Woolwich, filled with ball, rivetted, plugged, and boxed, .....	.....	.....	.....	321	15	0	354	11	6	212	12	0	171	4	0	148	9	4	121	0	0
100 Common Shrapnell Shell in India, filled and fixed, .....	.....	.....	.....	446	14	0	322	13	0	246	7	0	172	7	0	125	6	0	85	6	0
Brass Ordnance, Royal Arsenal, Woolwich, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brass Ordnance, India, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iron Ordnance, Woolwich, .....	294	0	0	154	5	8	425	4	8	367	8	0	306	11	4	249	0	0	.....	.....	.....
Iron Ordnance, India, .....	568	12	0	298	9	6	324	11	0	710	15	0	597	3	0	485	1	5	.....	.....	.....

The prices at the Royal Arsenal, Woolwich, includes material, labor, supervision, establishment, wear and tear of machinery, and 5 per cent. interest on the plant.

The difference in the cost of Round Shot is not entered, the Committee not knowing the expense of their manufacture at Woolwich, but it would probably be equal to that of the Common Shell. The Diaphragm Shell, if procured from contractors, would probably cost five or six times as much.

## AMMUNITION.

The Committee recommend the introduction of Boxer's Fuzes, Friction Tubes, and all other Laboratory Stores in use by the Royal Artillery. The existing store of Shrapnel Shell can be easily adapted for Boxer's Fuze by enlarging the Fuze hole to the required size; the larger natures of Common Shells can also be altered in like manner for this

purpose, but with the smaller natures, such as the 12 Pounder Common Shell which even now frequently fail in bursting, and which failures must of course be much more frequent with enlarged Fuze holes, it will be necessary to fit them with a Gun Metal Socket as in the shells of the Royal Artillery pattern; this alteration however can be easily effected and at little cost. The foundry at Cossipore, the Establishment at Roorkee, and all Magazines where machinery exists, would in a very short time complete the whole.

As regards all future supplies of Shot and Shells it is recommended that they be procured from the Royal Arsenal at Woolwich, by which, as has already been shown, *vide* Table, page 61, a very considerable saving in expense will be effected and the manufacture will be much more perfect than if procured from Contractors; they will of course be of the pattern adopted in the Royal Artillery.

The Committee feeling that uniformity in this respect is most essential, consider that no time should be lost in carrying out their recommendations to as full an extent as possible.

• Cartridges to be made in the same manner as those used by the Royal Artillery, and bound with two or more hoops to prevent their getting out of shape.

### ROYAL ARTILLERY CARRIAGES.

In reporting upon the Royal Artillery Carriages, it appears from the information received by the Committee, that,

*Vide Appendix—  
Colonel Turner's  
Letter and Report* in general, the wood of which these Carriages were constructed was very imperfectly seasoned, and altogether unsuited to this climate, and although, with great care, it may be possible to keep many of them in a serviceable state for some time, the Committee do not consider it advisable to recur to the importation of Carriages from England; it may however be advisable to procure from home the heavy iron work, such as Axletrees, Nave-boxes, Trail-eyes, Limber-hooks, &c., until the



requisite machinery is established in this Country for working it up. The English iron work, from the greater skill employed in its manufacture, is much stronger, and can therefore be made of a lighter form than that in the Bengal Carriages; it must however be understood that it is to be procured from the Royal Arsenal at Woolwich, and not from Contractors. The Committee recommend a supply of this iron work being procured with as little delay as possible.

There is at this moment a very great want of Carriages in this Presidency, and the Committee would beg strongly to urge upon Government the absolute necessity of immediately and permanently increasing the Establishment at Futteghur, to enable the Superintendent of the Gun Carriage Agency to meet the numerous demands upon that Manufactory. The arrival of the Royal Artillery in this country, and the almost total destruction from the effects of the climate of the Carriages received from England, together with the great losses caused by the Mutiny, have nearly doubled the demands upon the Gun Carriage Agency, and yet the Committee believe no addition has been made to the workmen, the Establishment of which is the same, or nearly so, as before the Mutiny.

### EQUIPMENT.

The question of Equipment next comes under the consideration of the Committee. This is the most important point in which uniformity is essential, in order that all Articles of Equipment and all stores of similar description, which must be kept in every Magazine, shall be identical throughout the Country, and available for all Batteries, to whichever Presidency or Service they may belong. It is also most desirable that the Nomenclature should be the same, for the purpose of facilitating the receipt and issue of stores, and to enable Officers to make out Indents in a manner that shall be intelligible to all Commissaries of Ordnance.

The Committee however feel that there must be great difficulty in enforcing uniformity in these matters, while

three separate Ordnance Select Committees exist in the three Presidencies, and although they feel that it is not for them to recommend the abolition of those separate Select Committees, yet, should it be considered desirable to retain them for any local purposes, it is now suggested that no changes whatever be permitted in the Equipment of Stores of any description belonging to the Artillery Service in any part of India, without being first submitted for approval to the Supreme Government. The Committee are aware that such is the present order, but they have reason to believe that it is not invariably attended to. The Committee however consider that the Service would derive great benefit from the formation of one Special Board of Artillery Officers, to whom all questions of this nature should be submitted previous to being forwarded to Government for approval. It should of course be composed of Officers belonging to each Presidency and the Royal Artillery, and it is also suggested that this Committee should be in constant communication with the Select Committee in England, in order that the Services may derive mutual benefit from the improvements that are recommended from time to time, whether at home or in this country, and in order to carry out the principle of uniformity to its fullest extent. With regard to Carriages, the Committee are of opinion that the Royal pattern Carriage should be adopted universally, with certain alterations to meet the requirements of this Country; they are already in many respects identical with the authorized pattern of the Indian Artillery.

The Lighter Ordnance of the Indian Artillery have already been recommended for general use in 9 Pounder Batteries, and it is now therefore proposed to retain the Trail Beams and Cheeks of the 9 Pounder Gun and 24 Pounder Howitzer of the Indian Carriages, with the exception of the Cheeks of the latter, which by being lengthened beyond the Trail-hump, will, it is thought, considerably strengthen the

Carriage.—This has been suggested by the Gun Carriage Agent, who also recommends a third bolt in rear of the Elevating Screw, as in the Royal Pattern Howitzer. In introducing the Trail Beams of the Indian Pattern for the 9 Pounder Gun and 24 Pounder Howitzer, care should be taken that the distance between the front and hind wheels be not greater than that in the Royal Carriages. The Trails of the 6 and 9 Pounder Guns and 12 Pounder Howitzer to be constructed with Humps where the elevating screw passes through, as in the Royal Carriages,

The Elevating Screws and boxes of the Royal pattern to be introduced; it is considered however that it will be an advantage if when the Trail-beam is made of two pieces, the bolts securing the elevating screw plate can be differently arranged, so as not to pass through the junction of the timbers.

The whole of the iron work of the Carriages to be of the Royal pattern, with the exception of the Trunnion plates and Cap-squares of the 9 Pounder Guns and 24 Pounder Howitzer, which must be of the Indian pattern to suit the lighter Ordnance. The Cap-squares in all Field Carriages may be advantageously secured to the Trunnion plates in the same manner as those of Heavy Guns on Travelling Carriages, to reduce the number of projecting eye-bolts and keys. The heads and nuts of the bracket bolts to be countersunk as in the Royal Artillery Carriages.

It has already been suggested that the iron work should be procured from the Royal Arsenal at Woolwich.

The Axletrees of the Bengal Artillery have been universally condemned as faulty in construction, extremely heavy, and at the same time easily broken, and it is believed those of Madras and Bombay have also frequently been found objectionable. The Committee therefore now recommend the introduction of the Royal Artillery pattern Axletree, Axletree arm, and Pipe-box throughout the Service. There have, however, hitherto been two kinds of Axletrees in

Field Batteries of Royal Artillery, a light one for 6 Pounder Batteries, and all Limbers and Waggon, and a heavy one for 9 Pounder Guns and 24 Pounder Howitzer; it is now proposed to discontinue the former altogether and adopt the heavy Axletree for all Field Carriages. This alteration has already been ordered at home, and as the Axletree now proposed for general use in this Country is considerably lighter than that used by the Indian Artillery, there will be no increase of weight to the existing Carriages of this Country. The Royal pattern Axletree is four inches shorter in the body than that of the Indian Artillery,

The Committee consider that the necessity for the perforations through the Axletrees, or at least two out of the three, which must of course weaken the iron, may be obviated by a different arrangement in the Cap-square or Eye-bolts, two of which now pass through the Axletree, but which can be kept perfectly secure in its bed by the iron clip bands under the Axletree bed, and brackets of the Carriage as in the 24 Pounder Howitzer of the Royal Artillery, each being secured to the latter by the Trunnion Plate-bolt in rear, and by the two Eye-bolts, one passing in front and the other in rear of the Axletree bed; the centre perforation it may be necessary to retain for the bolt through the beam of the Trail.

The Limbers to be fitted with Shafts of the Royal pattern instead of the Pole; the splinter bar to be lengthened accordingly, and the platform of the Limber to be entirely of the Royal pattern.

Lieutenant Colonel Johnson appends a Minute recording his opinion with regard to the substitution of the Shafts for the Pole.

With a view to reduce the alterations as much as possible, and to diminish the expense which must be incurred in order to carry out assimilation of Equipments, it is proposed to retain the Ammunition Boxes of the authorized Indian

pattern, but that in future they shall be made  $\frac{1}{2}$  inch wider and 1 inch deeper, in order to contain the same number of rounds as are carried with Batteries of Royal Artillery. The present boxes can be made to hold the required quantity but it is desirable that more space should be allowed in future. The 24 Pounder Howitzer box will require hollowing out to the depth of a  $\frac{1}{2}$  of an inch at the side to admit the Shell, but this will not materially weaken the box; the 9 Pounder Box will also require this to a trifling extent. The lids of the ammunition boxes to be allowed to project 3 inches on the inside, to give a broader seat for the Gunners, this is especially necessary on the Limber; and in the Horse Artillery, the Valises being carried on the Limber inside the guard iron, the space is very much reduced, and this addition is therefore the more requisite; all the boxes should be alike.

The lids must be fitted with straps for the Valises and Cloak, and Blanket Straps, as in the Royal Artillery.

Four Limber Boxes to be carried on the Waggon body, as in the Indian Artillery, instead of the two large boxes of the Royal pattern. The chief advantage of the latter is that a convenient space is left between the boxes and the wheels, where certain things are carried, such as Park pickets, and articles of Camp Equipage; these however are not used in this country, and the large boxes are always inconvenient from their weight. By adopting the Indian plan, one uniform box is introduced for all Batteries and Carriages, and assimilation is obtained with the least alteration in the existing equipments.

The Guard Irons and Handles of the boxes to be of the Royal pattern, except that they should be secured by bands of iron passing down the side and underneath the boxes, as in the Bengal Artillery; considerable increase of strength is gained in this way. It is considered however that one Guard Iron on the outside is sufficient. The two small

handles, one in front and one in rear, by which the box is attached to the Carriage, can be used in carrying the box on a bamboo, when necessary, upon men's shoulders, by attaching a piece of rope or strap to them and passing the pole through the loops thus formed. These handles however should be attached to the box by bands of iron passing down the side and underneath, as in the Bengal Boxes.

The Committee recommend an alteration in the mode of packing the Ammunition, as proposed by Colonel Hogge, C. B., by which the Shot and Shell are accessible without removing the Cartouche, which is not the case in all boxes of the present pattern, where the Shot and Shell are at the bottom and the powder at the top. The distribution however of the several natures of Ammunition as now existing in the Royal Artillery to be retained. The mode of packing is shown in the following Tables.

To be used in packing the Shot and Shell in the boxes, for the sake of preserving the partitions and wooden bottoms.

The Cartouche to be of leather or painted canvass, as in the Royal Artillery.

The small box on the Limber, to be made in the same size as that of the Bengal Artillery Limber, in order to carry certain Fuze Implements in addition to small stores already carried there, as shown in the accompanying Tables.

As regards the position of the Ammunition boxes on the Limber, it is recommended that the centre of each be two inches in front of the centre of the Axletree bed, and in order to leave more space for limbering up, that the pintle hook be brought 2 inches farther to the rear by the insertion of a block of wood between the iron and the Axletree bed. The position of the centre of the boxes in front of the centre of the Axletree will not increase the weight at the point of the Shafts, as from the new mode of packing the Ammunition, by which the Shot and Shell are behind and the

Cartridges in front, the weight of the whole is thrown more to the rear.

The Boxes on the Gun Axletrees to be of the Bengal pattern, and one, that on the near side, to be fitted to carry a few rounds of Ammunition; the slow match and other stores in the off box, as shown in the tables. Both boxes to be made into seats for Gunners in case of emergency; this will be practicable even with the 9 Pounder Gun and 24 Pounder Howitzer, in consequence of the increased space between the Wheels and Cheeks of the Carriage from the use of the smaller Ordnance; Guard Irons must be attached to the Axletree to protect the mens' arms from coming in contact with the wheels. It must however be understood that these boxes are not to be used as seats for drill purposes, but as an expedient on an emergency only, when it may be required to take the Guns forward at an increased pace, when by carrying two men in this manner and three upon the Limber, with the assistance of the mounted Non-Commissioned Officer, the Gun can be quickly brought into action and served with effect. The men will be fresh for the purpose, instead of being distressed and blown, as is now the case, even if they are able to keep up with the Gun at all, unless the Ammunition Waggon is brought under fire, but which by this arrangement will be rendered unnecessary.

The boxes should be of such a size as not to project over the nave of the wheel; the interior dimensions are shown in the following Tables. The Cartouches in the Axletree boxes to be of Copper.

The Spring Locks used by the Royal Artillery to be universally adopted for all Boxes, instead of the common padlock.

The Committee recommend the future adoption of the wooden handspike of the Royal Artillery, in place of the iron handspike of the Indian Service; it is easily stripped and unshifted, and is lighter, cheaper, and more easily re-

placed when broken than the other, but it is not necessary to make any change in the existing carriages.

The Drag Shoe being unnecessary in India may be discontinued.

The spare wheel to be carried on a block on the Perch of the Waggon without an Axletree Arm, but to be raised as high above the ground as possible.

Shafts must be carried under the Spare Waggon and Carriages that are drawn by Bullocks, that Horses may be substituted for those animals when necessary.

The Committee were desirous of personally seeing the foregoing alterations in Carriages perfectly executed before recommending them for approval, but from the want of a sufficient Establishment of Artificers at Meerut, have been unable to do so as completely as they wished; they are however convinced that the changes are not only practicable, but such as will tend considerably to the efficiency of the Service; and while the important point of uniformity in Equipment will have been gained in India, the expense of the change, owing to the trifling nature of the alterations, will be inconsiderable. These changes, when carried out, will also assimilate the Indian Equipment, at least in all essential points, to that of the Royal Artillery serving in other countries, which the Committee feel is no small advantage to have gained. It is now suggested that a supply of Axletrees and Pipe-boxes be immediately procured from the Royal Arsenal at Woolwich, in order that the present Carriages may be altered, and assimilation at once obtained in this very important point, and also that future Batteries may be constructed with the proposed alterations; and as, in all probability, the whole of the Field Artillery at present in the Service will, before many years are passed, be replaced by the Armstrong or some other breech-loading Gun, which will cause the remodelling of the Field Carriages, the Committee do not think it desirable that any more extensive



changes should now take place than those already suggested, but which, as the object is uniformity of Equipment, are absolutely necessary.

The Forge Waggon, Store Limber Waggon, Store Cart, and Hospital Cart of the Royal Artillery, the Committee propose to retain in the Service, although at the same time they feel that the form and construction of these Carriages may be improved, but having no means at hand of carrying out such experiments as they would wish, they would leave the question for future consideration, and doubtless more convenient Carriages can easily be constructed.

The Forge Waggon it is thought may be much improved by the substitution of a Revolving Fan instead of the ordinary Bellows, when more space will be obtained for Farriers' Tools and Stores; this Fan is now much used for such purposes.

The Store Limber Waggon is inconvenient from the nicety required in packing, and from the difficulty of getting at many of the Stores without removing the others.

The Store Carts might, it is thought, be constructed to hold a greater quantity of Stores without materially increasing the weight.

The Medicine or Hospital Cart is considered convenient in shape, but the India-rubber springs will not answer in this country, and therefore the substitution of others is recommended.

As regards Wheels, the Committee have already decided upon one uniform Axletree, Axletree Arm, and Pipe-box, viz., those of the Royal Artillery, for adoption throughout India; and as these are the most important points in which uniformity is essential, all wheels being already 5 feet diameter, it appears to them of less consequence what the actual construction of the wheel itself may be, whether with wooden or metal Naves, ring or streak tire, or whether the spokes are formed and driven exactly in a similar manner to those

of the Royal Artillery, or as in the wheels of the several Indian patterns, provided they are sufficiently of a size to admit of the same half-wroughts being used generally for all wheels. Metal Naves have been adopted in Madras, it is supposed in consequence of the difficulty of procuring suitable timber, and it appears they have been found to answer there. The Committee however consider wheels so constructed objectionable, especially as they prevent that assimilation which is so essential to the efficiency of the Service. The half-wroughts also of these wheels are of a different size from those of other patterns, in itself a most serious objection, and one which at once prevents uniformity; but should the Government approve of the continuance of these Wheels in the Madras Presidency, they would strongly recommend that it be on condition of the Naves being provided with a separate and moveable Pipe-box of the Royal Artillery pattern, and that the spokes and felloes be so formed that the half-wroughts used by the other Services will answer for them. Under the present circumstances, a Madras Battery serving in either of the other Presidencies could not be supplied with naves or half-wroughts from the Magazines; nor could a Battery from Bombay or Bengal serving in Madras procure Naves.

The Bengal Wheels when fitted with the Royal pattern Pipe-box will answer for all Carriages, if the Nave is slightly reduced in diameter, to admit of its riding under the frame of the Limber box; the Bombay Wheel is supposed to be similar to that of Bengal. It is thought the Naves might be advantageously made more of a barrel shape by reducing the diameters at both ends.

It will be observed that the Committee have proposed a spare Howitzer Carriage to accompany Batteries, in place of the spare Gun Carriage as in the Royal Artillery; the former description of Carriage has always been used for this purpose in the Indian Artillery. The Gun is easily fitted to it by placing metal rings with shoulders on the Trunnions,

the Elevating screw working under the breech, and it can in this manner be fired without injury to the Carriage; but as fixed elevating screws are now used, it is recommended that metal heads be fitted to that of the spare Carriage for the Gun to rest upon.

The Committee would call the attention of Government to the great want of seasoned timber for Artillery Carriages, and beg to urge the necessity of adopting such measures as will ensure an immediate and constant supply of this important article, upon which the efficiency of the Artillery Service so much depends. With regard to the different natures of wood of which the Carriages should be constructed; the Committee do not think it necessary to make any suggestion upon this subject, which has been so frequently under consideration; but whatever woods are most easily procurable at the different Presidencies, and at the same time have been found the best adapted for the various purposes, and suited to resist the effects of the climate, should be continued; uniformity in this respect not being of so much importance. The proceedings of a Committee assembled at St. Thomas' Mount for the purpose of reporting upon this subject, and also upon the strength and construction of the Carriages in the Madras Presidency, will be found in the Appendix.

As regards the requirements of this Presidency, it appears to the Committee that the wood will be of better quality if purchased in Calcutta, and the half-wroughts stored in lower Bengal for three years before being sent up country, when the hot winds will complete the seasoning. This recommendation has, it is believed, already been made by a special Committee at Futtehghur, which assembled some years ago.

As regards travelling Carriages for Heavy Ordnance, such as are used in India for Heavy Field Batteries; the Committee would observe that in England there have recently been constructed Block Trail Carriages for 24 Pounder and

32 Pounder Guns, which will henceforth be used for Siege Trains, and they recommend that the same description of Carriage be constructed for the 18 Pounder Guns used with Heavy Field Batteries in India, for experiment, and if approved, to be adopted in the Service. It is thought the Carriage of the 8-inch Howitzer might easily be altered so as to be limbered up in the same manner, if it should be found impracticable to construct a block trail Carriage for this piece of Ordnance. A travelling Carriage for Mortars has also been introduced into the Service at home, and it is thought that such a Carriage for the 8-inch Mortars attached to Heavy Field Batteries in this country would be found most useful. Working drawings of these Carriages can be procured from the Royal Carriage Department in England, and it is suggested that the Gun Carriage Agent at Futtehghur be directed to prepare Carriages accordingly, for experimental purposes.

MINUTE BY LIEUTENANT COLONEL JOHNSON.

In establishing the "Detachment" as the standard system for the Indian Artillery, the shafts used in the Royal and Bombay Artillery is proposed to take the place of the pole in the Bengal and Madras Presidencies; but as I have always considered the pole to be the preferable equipment, I am anxious to record my opinion to that effect. I submit that the experiments which have been carried on in this country have not by any means proved the superiority of the shaft; and though this equipment obtains in the Royal Artillery and in that of the Bombay Presidency, and is approved of by several Bengal Officers, yet when it is considered that the French, Prussian, and Austrian, as well as the Bengal and Madras Artillery, all use the pole, its comparative inferiority cannot be accepted as a fact, though for purposes of assimilation it may be advisable to supersede it by shafts.

(Signed) E. B. JOHNSON, Lieutenant Colonel.

## MINUTE BY COLONEL HUYSHE.

Although a matter of minor importance I must beg to record my dissent to the wooden trail handspike, in use with the Royal Artillery, being adopted instead of the iron one used by the Indian Artillery. I consider the latter to be in all respects infinitely preferable to the former.

As regards neatness of appearance there can hardly be two opinions; the iron one is more handy to use, gives a better lever for trailing the Gun, and is not detached, and therefore cannot be lost. There are already plenty of things appertaining to a Gun that can be lost, without unnecessarily adding to their number.

The iron handspike can hardly be broken—I never remember to have heard of one being broken—and it can readily be mended even if it should. The use of the wooden handspike entails the necessity of carrying a spare one for each Gun, which is inconvenient and cumbersome.

(Signed) ALFRED HUYSHE, Colonel.

I entirely concur in the above remark.

(Signed) C. HOGGE, Colonel.

„ E. P. JOHNSON, Lieutenant Colonel.

## HARNESSES.

Harness of the Royal Artillery pattern to be adopted with the following alterations, which are suggested as improvements.

The Royal Artillery Drivers' Saddle being of a bad shape, and not well suited to the Horses of this country, the Committee cannot recommend its continuance in the Service. The Saddle now used by the Bengal Artillery appears also to be disapproved of, and the Committee have therefore endeavoured to procure from England a saddle, proposed a short time back for universal use in the Royal Artillery, which, when received, will be submitted for approval. This saddle was intended to be used not only by the Drivers

but by the mounted men of Horse Artillery and Field Batteries, and it will unquestionably be a great advantage to have one saddle for general use.

All saddles to be fitted with wallets to carry *Curry Comb and Brush, Mane Comb, Harness Brush, Oil Can, Sponge, Pricker, &c*; these wallets should be made with gussets in order to lie flat when empty.

Saddles to be carried on the off leaders instead of pads. The valise can be easily secured to the saddle, and has been constantly so carried by Batteries of the Royal Artillery when using the Bengal equipment on first arrival in this country.

Centre horses of teams of 6, or wheel centre horses of teams of 8 in the Guns, to carry wheel harness, which will give six additional double sets to each Battery, and at the same time enable one or both of these horses to be quickly shifted into the wheel, in case of a wheel horse being disabled, the near Tug of the Shaft Harness, if found to interfere with the Driver's leg, can be carried on the Shaft close to the Splinter Bar, to which it can be strapped, and it will there be ready for use. This extra wheel harness must be fitted with long traces for ordinary use, and the short ones carried in the Store Carts; the long traces can be used in the wheel upon an emergency, by passing each once round the Splinter Bar and once round the Shaft, and hooking them together in the centre; the near trace of the riding horse must be passed twice round the Splinter Bar outside the iron stay, and then hooked to the other. The short trace pieces added to the wheel traces to adapt them for the lead, only answer as an expedient, and would be extremely inconvenient for constant use, particularly in the rapid movements of Horse Artillery, the weight of the additional hook and ring cause them to hang low and to be much in the way. Should the foregoing suggestion be approved, it will of course cause an alteration in the quantity of harness pro-

posed for Batteries in the details already submitted, the number of wheel sets being increased and lead sets diminished, the proportions are shown in the following lists of stores with Batteries.

An improved Trace Hook, similar to that used by the Bengal Artillery, but with a button and shoulder is recommended for adoption.

The rein rings on the bits for the draught horses are to be loose and not fixed, as in some lately issued for the Royal Artillery.

It is stated by the Members of the Committee belonging to the Bengal Artillery, that the present rope traces are frequently destroyed, especially while in store, by insects; leather traces have been suggested in consequence, and a few have been made; the Committee recommend that before being introduced into the Service, they shall be well tried by a number of Batteries of the different Services.

It is recommended that twelve mounted Non-Commissioned Officers, viz., Numbers 1 and coverers of Field Batteries, shall carry web harness on their horses in the same manner as certain numbers in the detachments of Horse Artillery.

The Committee beg to point out to the Government the difference in the mode of supplying Horse Appointments to Officers of Field Batteries in the Royal and Indian Artillery, and feel that uniformity ought to exist in the different Services in this respect. In the Field Batteries of Royal Artillery the Officers' Horse appointments are a part of the equipment of the Battery, and issued by Government; in the Indian Artillery they are the property of the Officers. The Committee recommend the Royal system to be adopted, as the Officers do not receive mounted pay, and are liable to be removed from Field Artillery at any moment.

The Committee do not recommend the future importation of harness from England, as they consider it can be made of sufficiently good quality and at a cheaper rate in this coun-

try. They however suggest the necessity of Government Establishments, both for the preparation of leather and for the manufacture of the harness itself. The iron work appears to be of extremely bad quality as issued from the Magazines in this country, and has to a considerable extent to be re-made by Officers Commanding Batteries before it can be used with safety; this is most objectionable, and if such difficulty exists in this country in manufacturing this article, it should be procured from England; it is supposed however that if made in Government Establishments it would be of good quality. As regards the preparation of leather, the Committee consider it will be sufficient if the tanned hides are procured from Native contractors, being very carefully examined and selected, and then dressed under skilled European superintendence; the dressing of the leather is an important process in its preparation, and one upon which its quality mainly depends.

#### ARMING OF THE SOLDIER.

It is certainly most desirable, and especially so in India, that every Soldier, without reference to his duties, should be provided with some weapon. In the Royal Artillery, the Drivers of the Horse Brigade have none at all, and in the Field Batteries, with the exception of the 24 men who have Carbines, the only weapon is a Sword-bayonet, a most imperfect arm in itself, and from the manner in which it is attached to the person, extremely inconvenient.

The Committee recommend that every Soldier of the Horse Artillery, whether Gunner or Driver, should be armed with a Light Cavalry Sword; and as regards the Field Batteries, without making a change in those who now carry the Light Cavalry Sword, viz., mounted Non-Commissioned Officers and Trumpeters, they recommend in substitution of the present Sword-bayonet, that every man be armed with a short straight sword, to be worn in a long frog belt with two short



slings, similar to that used by the Irregular Cavalry ; the blade of the sword to be that of a ship's cutlass, with flat steel handle, leather scabbard and steel mountings. The Committee have not the means of procuring a sword for submission to Government, but offer this recommendation as one which they think it worthy of consideration. Should the Government not approve of a new weapon, the Committee would then recommend that all men attached to Light Field Batteries be armed with the new Light Cavalry Sword.

The Committee consider 24 Carbines a very good proportion for each Battery whether of Horse or Field Artillery, but they condemn altogether the addition of a Sword-bayonet, which appears to them perfectly useless.

Reserve or Garrison Batteries may be equipped as heretofore, with a Carbine and Bayonet for each man, except the Staff, Non-commissioned Officers, and Trumpeters.

LIST of Harness, Horse Appointments, &c., required for Batteries of  
Horse and Field Artillery, as proposed by the Committee.

	6 Pounder Battery Horse Artillery	9 Pounder Field Battery.	
Horse Appointments, sets, . . . . .	70	20	At present different in pattern.
Harness, sets, double, Lead, . . . . .	25	36	
Harness, sets, double, Wheel, . . . . .	24	23	Including centre horses of Gun Team.
<b>ADDITIONAL ARTICLES.</b>			
Bridles, Twisted Snaffle, complete, . . . . .	48	48	For riding drill, &c.
Hames, pairs, with Straps, spare, . . . . .	12	12	
Harness, Web, sets, single, . . . . .	24	12	
Reins, Side, . . . . .	12	12	For occasional use on off horses.
Reins, Running, . . . . .	12	12	For breaking horses.
Straps, Kicking, . . . . .	6	6	
Straps, Cloak, . . . . .	122	....	Two each for dismounted men.
			{ Three each for dismounted men
			{ of Horse Artillery. Two each for
Straps, Luggage or Valise,* . . . . .	183	202	{ Field Batteries with Knapsack ;
			{ if Valises are supplied, 3 each =
			{ 308.
Sheepskins, Drivers' shape, † . . . . .	61	....	One each for dismounted men
			Horse Artillery.
Traces, Long, (pairs,) . . . . .	12	12	For centre horses Gun Teams.
Traces, pieces, Short, (pairs,) . . . . .	6	6	For occasional use.
<b>LONGEING ARTICLES.</b>			
		For each Battery.	
Bridles, Mouthing, . . . . .	2		
Cavesson with Cords, . . . . .	2		
Cross Trees, . . . . .	2		
Whips, } Hand . . . . .	4		
} Longeing, . . . . .	2		

\* These Straps should be issued with the Valises; those for Knapsacks with the Equipment of the Battery.

† Or Water Decks, or Water-proof Covers for Valises. If Valises are given to Gunners of Field Batteries instead of Knapsacks, 101 will be required.

EACH Set of Horse Appointments and each Double Set of Harness, consists of the following Articles.

	Horse Appointments	Lead Harness	Wheel Harness	REMARKS.
Back and Bellyband, . . . . .	1		1	
Breastplate, Martingale, . . . . .	1		1	
Bits, T, with Reins, . . . . .	1	2	2	
Breechings, { Near, . . . . .			1	
{ Off, . . . . .			1	
Buckling Pieces, . . . . .		2	2	
Bridles, { Curb, Portsmouth, . . . . .	1			
{ Harness, . . . . .		2	2	
Churns, Farriers' (pairs) . . . . .	1			Farriers and Shoeing Smiths only, instead of Wallets.
Collars, { Head, Stall, . . . . .	1	2	2	
{ Neck, Horse, . . . . .		2	2	
Cruppers, . . . . .	1	2	2	Those for the Hussar Saddle used by Royal Horse Artillery are different.
Girths, . . . . .	1	2	2	
Hames, Iron, (pairs) . . . . .		2	2	
Head, Stall, Bri- { Curb, Portsmouth, . . . . .	1			
dles complete, { Harness, . . . . .		2	2	
Leggins, . . . . .		1	1	
Numnahs, . . . . .	1	2	2	
Pocket, Shoe, (pairs) . . . . .	1			
Pilches, . . . . .	1			For Hussar Saddle used by Royal Horse Artillery only.
Reins, { Bearing, . . . . .		2	2	
{ Chain, . . . . .	1	2	2	
{ Curb, . . . . .	1			
{ Leading, . . . . .		1	1	
Saddles, { Riding, . . . . .	1	2	1	
{ Luggage or Pad, . . . . .			1	
Stirrups, { Irons, (pairs), . . . . .	1	2	1	
{ Leathers, (pairs), . . . . .	1	2	1	
{ Cloak, . . . . .	1	1	1	
{ Churn, . . . . .	2			Farriers and Shoeing Smiths only.
Straps, { Flank or Bearing, . . . . .		4	4	
{ Wither or Meter, . . . . .		2	2	
{ Hame, . . . . .		2	2	
{ Luggage or Valise, . . . . .	3	3	3	These should be issued with the Valises.
{ Retaining, . . . . .	1			With Saddle Sheepskins only.
{ Shoe-pocket, . . . . .	2			
{ Wallet, . . . . .	2	4	2	
Surcingle, . . . . .	1	2	2	Different for Hussar Saddle.
Traces, (pairs), { Lead, . . . . .		2		
{ Wheel, . . . . .			2	
Tugs, Backband, (pairs), . . . . .			1	
Sheepskins, . . . . .	1	1	1	For mounted men other than Drivers, these are larger to cover the saddle, if these should be discontinued, the same Covers for Valises should be issued as are sanctioned for Drivers and dismounted men.
Whips, Drivers', . . . . .	1			
Harness Brushes, . . . . .	1			

DETAIL of Ammunition, Stores of all kinds, Harness, &c., for 6 and 9 Pounder Batteries, each consisting of 4 Guns and 2 Howitzers, with 6 Ammunition Waggons, one to each piece; 1 Forge Waggon, 1 Store Limber Waggon, 1 Spare Howitzer Carriage, 2 Store Carts, and 1 Hospital Cart.

	NATURE OF ARTICLES.		WHERE CARRIED.		
	4, 6 Pr. Guns & 2, 12 Pr. Howrs.	6 Pr. Battery.	4, 9 Pr. Guns & 2, 24 Pr. Howrs.	9 Pr. Battery.	
AMMUNITION.	Cartridges	Filled, { Gun, . . . . .	780	524	In Ammunition Boxes, as shown in Tables.
		Howitzer, {	333	225	
	Serge,	Empty. { Gun, . . . . .	400	400	do. do.
			Howitzer, {	200	200
	Cartridges, Ball, Carbine, . . . . .		480	480	10 rounds in each Pouch, 10 in Kitts,
	Caps, Percussion, Carbine, . . . . .		600	600	
	Burstors for	Diaphragm { Gun, . . . . .	96	96	When the Shells are not filled the Burstors must be carried with the Cartridges.
		Shell, { Howitzer.	162	108	
	Fuzes, Boxer's 5} in.	Common Shell, Howitzer,	126	90	To be made up in bundles of 8 each, in wax-cloth, and carried in Ammunition Boxes.
		Diaphragm, {	328	272	
	Match.	Common, . . . . .	160	112	a A portion to be carried in off Axletree Box the rest in the Ammunition Boxes of Waggon body.
		Slow, (lbs.) a . . . . .	24	24	
	Portfires, c	Quick, (ozs.) b . . . . .	12	12	b In small Tin Cylinders, in lengths and carried in Ammunition Boxes of Waggon body.
			78	78	
	Shells.	Carass, Howitzer, d . . . . .	8	4	c On lid of each Limber Box.
Common, Fixed, Howitzers, e		126	90		
Shot,	Guns, f . . . . .	90	90	d In Ammunition Boxes, as shown in Tables.	
	Diaphragm, Fixed, { Howr., g	163	108		
Tubes, Friction, j . . . . .	Case, Fixed, { Guns, h . . . . .	60	60	e do. do.	
	Howitzers, i . . . . .	37	23	f do. do.	
Axletrees, Iron, Royal Artillery } . . . . .	Round, Fixed, Guns, k . . . . .	62	368	g do. do.	
pattern, spare, m . . . . .		190	190	h do. do.	
Boxes, Brass, Trunnions, n . . . . .		2	2	i do. do.	
Buckets, Leather, Field Gun, o . . . . .		2	2	j do. do.	
CARRIAGES, PARTS OF CARRIAGES.	Ammunition, with Limbers, complete, . . . . .		32	32	k do. do.
			6	6	l do. do.
	Carts, Store, . . . . .		2	2	m Under the bodies of two Ammunition Waggons.
	Field, with Limber and Elevating } Screw, Gun, }		4	4	n Off Axletree Box.
	" Howr.		3	3	o On rear of Limber Axletrees 2, and Axletrees of Store Carts, 1.
	" Forge Waggon, with Limber, complete, . . . . .		1	1	
	Hospital Cart, . . . . .		1	1	p Attached to Trails and Perches of Limber Carriages
	Store Limber Waggon, complete, . . . . .		1	1	
	Chains, Locking, Field Carriage, q . . . . .		15	15	q On Foot-boards of Limbers.
	Drag-ropes, (pairs), r . . . . .		15	15	
HAIF-WROUGHTS AND PARTS OF CARRIAGES.	Beams, Trail, Gun, fitted with Loop, } otherwise in the Rough, }		1	1	When in the Field only, under spare Waggons.
			2	2	
	Cheeks, in the Rough, . . . . .		2	2	When in the Field only, in Store Carriages.
	Perch, Waggon, fitted with Loop, } but otherwise in the rough, }		1	1	
	Splinter-bars, fitted with Iron work, . . . . .		2	2	Under one of Ammunition Waggons or spare Carriages.
	Shafts, finished, complete, (pairs), . . . . .		2	2	
	Wheels, { Feloes, in the rough, . . . . .		12	12	In Store Waggon or Cart
	Spokes, in the rough, . . . . .		24	24	
	Wheels, complete, spare, r . . . . .		4	4	s On Perches of Waggons, 1 on Perch of Store Limber Waggon.
			4	4	

## Detail of Stores, &amp;c., (continued.)

NATURE OF ARTICLES.	6 Pr. Battery		9 Pr. Battery		WHERE CARRIED.
	4, 6 Pr. Guns & 2, 12 Pr. Howrs.	6 Pr. Battery	4, 9 Pr. Guns & 2, 24 Pr. Howrs.	9 Pr. Battery	
GUN IMPLEMENTS.	{ Aprons, Canvass, Field Gun, . . . . .	6	6		Over the Vent.
	{ Caps, Canvass, for Spunges, . . . . .	12	12		On Spunge Heads.
	{ Car-touches, { Leather or painted { Gun, . . . . .	32	32		} Ammunition Boxes.
	{ Canvass. { Howr., . . . . .	18	18		
	{ Small Copper, { Gun, . . . . .	4	4		} Near Axletree Box.
	{ Howr., . . . . .	3	3		
	{ Cutters, Portfire, . . . . .	7	7		On each Trail.
	{ Hammers, { Claw, . . . . .	6	6		Off Axletree Box.
	{ Wrench, . . . . .	6	6		do.
	{ Hand-spikes, Traversing, . . . . .	12	12		1 on and 1 under each Trail.
	{ Heads, Spare, { Rammer. { Gun, . . . . .	4	4		} In small box on Waggon Limber.
	{ Spunge. { Howr., . . . . .	2	2		
	{ Gun, . . . . .	4	4		
	{ Irons, Priming, (sets), . . . . .	2	2		} Off Axletree Box, in each set { 2 Wires.
	{ Lanyards, for Friction Tubes, . . . . .	6	6		
	{ Pincers, Gun, . . . . .	24	24		{ 1 Spiral-bit.
	{ Pockets, Leather, for Tubes, with } Straps	6	6		Off Axletree Box.
	{ Punches, for Vents, . . . . .	12	12		1 in each small box on Gun Limber, 1 in Off Axletree Box.
	{ Spikes { Spring, . . . . .	12	12		In Off Axletree Boxes.
	{ Common, . . . . .	6	6		do.
{ Sticks, for Portfires, . . . . .	12	12		1 with each Gun.	
{ Sockets, for Portfires, . . . . .	6	6		1 on near side of each Trail.	
{ Spunges, Field, { Gun, . . . . .	8	8		} 1 on and 1 under each Trail.	
{ Howitzer, . . . . .	4	4			
{ Worm, for Wad-hooks, Bengal pattern, . . . . .	6	6		[Head.	
{ Thumb-stalls, . . . . .	6	6		Off Axletree Box, to screw into Rammer Off Axletree Box.	
{ Drivers, Screw, { For metal plugs in Fuze holes, . . . . .	12	12		1 in each small box, on Gun and Waggon Lumber.	
{ Funnel, Leathen, with Copper tube, . . . . .	12	12		do. do.	
{ Implements, { Borers, 2 } for Boxer's { Cylinders, 2 } Fuzes, each { Handles, 1 } complete set contain- { Bits, 24 } sets, ing. { Bags, 5 } { Sections, 5 }	6	6		Small box Gun Limber.	
{ Instructions for do., . . . . .	12	12		Where convenient.	
{ Knives, Laboratory, . . . . .	6	6		Small box, Waggon Limber.	
{ Mallets, Fuze, small, . . . . .	6	6		} Small box, Gun Limber.	
{ Setters, Fuze, small, . . . . .	6	6			
{ Needles, Stitching, . . . . .	24	24			
{ Silk or Worsted, for making Car- } tridges (ozs.), . . . . .	12	12		Small box, Waggon Limber.	
{ Pincers, Fuze, (pairs), . . . . .	6	6		} do. do.	
{ Scissors, (pairs), . . . . .	6	6			
{ Laboratory, { Callipers, Gunners, . . . . .	2	2		} do. do.	
{ Instruments, { Rules, Gunners, . . . . .	2	2			
{ Telescopes, Small, . . . . .	1	1		Where convenient.	

## Detail of Stores, &amp;c., (continued.)

NATURE OF ARTICLES.	6 Pr. Battery.		9 Pr. Battery.		WHERE CARRIED.	
	4.	2.	4.	2.		
Couples for Wads, .. .. .	24	24			2 in each small box on Limber.	
Jacks, Lifting, New, Royal Artillery } pattern, .. .. .	6	6			1 on each Waggon Limber Foot-board.	
Keys, for Spring Locks, .. .. .	18	18			3 to each subdivision,	
Line, Hambro, (skeins), .. .. .	6	6			1 in each Waggon body.	
Marline, (skeins), .. .. .	6	6			do. do.	
Locks, Pad, with Keys, .. .. .					As wanted.	
Mauls, Wood, .. .. .	6	6			1 under each Waggon body.	
Ordnance, Brass, { Gun, .. .. .	4	4				
{ Howitzer, .. .. .	2	2				
Pintail Hook, Limber, .. .. .	1	1			Store Waggon.	
Pins, Linch, spare, .. .. .	13	13			1 in each small Limber Box.	
Prolonges, .. .. .	6	6			Between Limber Boxes of Gun and Howitzer.	
Saws, Hand, in Leather cases, .. .. .	3	3			Outside boxes, Waggon body.	
Sets, Saw, .. .. .	3	3			Small boxes on Limber.	
Files, Saw, .. .. .	9	9			do. do.	
Punches, Spring, for Leather, .. .. .	6	6			1 in each small box, Gun Limber.	
TOOLS IN-FRENCH ING.	{	Shovels, .. .. .	15	15	Near-side, } of each Limber.	
		Spades or Mattocks, .. .. .	15	15		Off-side, }
		Axes, { Felling, .. .. .	15	15		Front of Foot-board, }
		{ Pick, .. .. .	15	15		Under Axletree, }
		{ Hand-bills, .. .. .	15	15		Off-side of under Foot-board, }
Swingletrees, .. .. .	18	18			1 for each Carriage, on Splinter-bar.	
Straps for Side-arms, .. .. .						
Screws, Tangent, spare, .. .. .	6	6			1 in each small box on Gun Limber.	
Washers, Drag, spare, .. .. .	12	12			1 in each small box on Limber.	
Tins, Grease, (1½ lb.) .. .. .	18	18			1 in front of each Limber Axletree bed, and of Axletree of Carts.	
Magazine, Grease, (28½ lbs.) .. .. .	6	6			Under each Waggon body, near-side, in rear.	
Shoes, Horse, 5 sets of Nails to each, (sets),	180	180			In boxes under Waggon body, 10 sets in each box.	
Water-keg, .. .. .	1	1			Under Hospital Cart.	
<b>ARMS AND ACCOUTREMENTS.</b>						
Ball Drawers, .. .. .	2	2				
Belts, {	Waist, complete, according to pattern, .. .. .	180	180			
		Pouch, complete, with Pouch & Cap-pocket, .. .. .	24	24		
Buckling pieces, Sword, spare, .. .. .	20					
Bugles, Field, .. .. .	2	2				
Carbines, .. .. .	24	24				
Cramps, Main-spring, .. .. .	3	3				
Jags, Brass, .. .. .	24	24				
Knots, Buff, Sword, .. .. .	180	180				
Stoppers, Muzzle, .. .. .	24	24				
Swords with Scabbards, .. .. .	180	180			According to pattern sanctioned for Horse Artillery and Field Batteries.	
Slings for Bugles or Trumpets, .. .. .	4	4				
Trumpets, .. .. .	2	2				

## No. 3.—COLLAR MAKERS' TOOLS AND IMPLEMENTS.

(To be carried in Store Limber Waggon and Store Cart.)

Chests, one to each European Artificers, containing:—

Blades, Awl,	{	Backing, ... ..	6	Needles,	{	Assorted, Saddlers', ... ..	150
		Drawing, ... ..	2			Collar, ... ..	18
		Pannel or Seat, in 2 sizes, ...	4			Harness, ... ..	150
		Garnishing, in 2 sizes, ...	4			Quilting or Darning, 4 inch,	12
		Harness, in 5 sizes, ...	24			Stitching, ... ..	25
Buckllog,	{	Large, ... ..	3	Irons, Pricking, of sorts, ...	3		
		Small, ... ..	3	Nail, Claw, ... ..	1		
Hafts for ditto,	{	Drawing, ... ..	4	Pincers, Saddlers', ... ..	1		
		Harness, ... ..	3	Rasps, Shoemakers', ... ..	1		
		Seat, ... ..	4	Punches,	{	Bridle, Middle, ... ..	2
Awl, Tug-handled, ... ..	1	Bridle, Large or Stirrup, ...	2				
		Bone, Hollow, ... ..	1			Strap, { Large, ... ..	2
Chisels, Cold Carpenters' 8 x ¼ inch,	1						
		Clams, (pairs), ... ..	1	Trace, { Large, ... ..	2		
Compasses, ... ..	1					Small, ... ..	2
		Crease, Single, ... ..	1	Turkey Stone, { Oil-stone, ...	1		
Saddlers, ... ..	1					Rub-stone, ... ..	1
		Hammers, { Rivetting, { 1½ lb.,	1	Rule, 2-foot, four-fold, ... ..	1		
1 lb., ... ..	1					Scissors, 9 inch Tailors', ...	1
		Handle, Hammer, Hand, ... ..	1	Screw-driver, 6 inch, ... ..	1		
Head, Pin, Nose, ... ..	1					Spoke-shave, Collar Makers', ...	1
		Marking, 10 to a set, (sets),	1	Thimbles, Tailors', ... ..	2		
Palm, ... ..	1					Tools, Edge, 3 sizes, ... ..	3
		Collar, 23, 29, and 34 inch,	3	Creases, { Screw, ... ..	1		
Seat stuffing, 11 and 14 inch,	2					Shoulder-vein, ... ..	1
		Head, ... ..	1	Single, ... ..	1		
Half-round, ... ..	1					Pincers, Common, ... ..	1
		Hand, Straight, ... ..	1	Seam-turners, ... ..	1		
Lead, piece to punch on, 8 lbs.,	1					Nippers, (pairs), ... ..	1
		Boxwood, Tanners', ... ..	1	Pliers, Flat-nose, ... ..	1		
Collar, ... ..	1					Steel, Butchers', ... ..	1
		Wood, ... ..	1	Gauge, Plough, Collar Makers',	1		

## JOBGING SMITHS' TOOLS AND IMPLEMENTS.

(To be carried in Store Limber Waggon and Store Cart.)

Chests, ... ..	1	Files, Bastard,	{	Drills, Smiths' or Armourers', ...	5		
Brace, Iron, Smiths', ... ..	1			Flat, Rubbers, 16 inch, ... ..	3		
Bits for do., { Rimer, { Square, ...	1			Flat, { Rough, 14 inch, ... ..	10		
						Half-round, ... ..	6
Cold, Smiths', ... ..	2			Flat, { 10 inch, ... ..	4		
						Hot, ... ..	1
Rod, ... ..	1			Half-round, { 16 inch, ... ..	4		
						Compasses, 7 inch, ... ..	1
Callipers, 9 inch, ... ..	1			Round, { 12 inch, ... ..	4		
						Bow-drill, Iron, Smiths', ... ..	1
Boxes, Drill, Wood, ... ..	6			Square, { 10 inch, ... ..	2		
						Strings, Drill, Catgut, Knots, ...	6
Plates, Breast, Iron, Smiths', ...	1			Thres-square, { 12 inch, ...	1		
						Stock, Drill, Smiths' or Armourers',	1
Warding, assorted, ... ..	2	Handles for Files, ... ..	6				

Hammers,	{	Uphand, 7 lbs., ... ..	1	Stock and Dies, with Wrench, Small,	1	
		Hand, Smiths', 3½ lbs., ... ..	1	Plate, Screw, with 10 taps, ... ..	1	
Handle, Hammer,	{	Hand or Rivetting, 24 ozs.,	1	{	Fore-bit, ... ..	1
		Setting, Smiths', Handled, ... ..	1		Plier, ... ..	1
Irons, Numbering, 10 to a set, (sets),	{	Uphand, ... ..	1	Tongs,	Hammer, ... ..	1
		Hand, ... ..	1		Hollow-bit, ... ..	1
Punches,	{	Hot, Smiths', ... ..	2	Vice,	Bolt, ... ..	1
		Cold, ... ..	1		Portable, 36 lbs., ... ..	1
Saws, Slitting, ... ..	1	Hammer, Wrench, Small, ... ..	1			
Square, Iron, Figured, ... ..	1	Chest, Tool, Field Service, ... ..	1			
Stone, Oil, without Frame, ... ..	1	Lock, Pad, Iron, Middling, Single.	1			
Stone, Rag, ... ..	1	Plate, Screw, 4 taps, Double-handed,	1			
Screw-driver, 6 inch, ... ..	1					

## WHEELERS' TOOLS AND IMPLEMENTS.

(To be carried in Store Limber Waggon and Store Cart.)

Chests, one to each European Artificer, containing:—

Adze, Wheelers', ... ..	1	Files,	{	Flat, 14 inch, ... ..	1							
Handle for ditto, ... ..	1			Bastard,	{	Half-round, 12 inch, ... ..	1					
Axe, Broad, ... ..	1	Saw,	{	Round, 14 inch, ... ..	1							
Handle for ditto, ... ..	1			Hand, ... ..	18							
Blades, Awl, Brad, ... ..	36	Rasp, Half-round, Coarse, 12 inch,	1	Gimlets,	or Spike, ¼ inch, ... ..	2						
Handles for ditto, ... ..	6	Gauges,	{		do. ⅜ inch, ... ..	2						
Augurs, Shell,	{			½ inch, ... ..	1	Bits, 1/16 inch, ... ..	2					
		¾ inch, ... ..	1	Boxing, Wheelers', 1½ inch, ... ..	1							
		1 inch, ... ..	1		Firming or	{	¼ inch, ... ..	1				
		1½ inch, ... ..	1				Scribing,	{	¾ inch, ... ..	1		
		Handles for ditto, ... ..	4	Scribing,	{	1 inch, ... ..	1					
Bag, Tool, ... ..	1	Pecking, ... ..	1									
Bevel, Steel-blade, 12 inch, ... ..	1	Gauges,	{	Mortice, ... ..	1							
Buzzes, ⅜ inch, ... ..	1	Single, ... ..	1	Hammers,	Sledge, 12 lbs., ... ..	1						
Bar, Crow, Hand, 7 lbs., ... ..	1	Hammers,	{		Hand or Rivetting, 24 oz.,	1						
Compasses, Wing, Smiths', 10 inch,	1			Hand, Smiths', 3½ lbs.,	1							
Chisels,	Cold,	{	Hand, 8 × ⅜ inch, ... ..	2	Handle, Hammer,	{	Hand, ... ..	1				
				Rod, ... ..			2	Sledge, ... ..	1			
	Firmer,	{	1 inch, ... ..	1	Knives, Drawing, Carpenters',	... ..	1					
								1½ inch, ... ..	1	Line, Chalk, Carpenters, ... ..	1	
												1 inch, ... ..
	Socket,	{	1 inch, ... ..	1	Mallet, Wood, Carpenters',	... ..	1					
								1½ inch, ... ..	1	Pencils, Black-lead, ... ..	12	
	Mortice,	{	1 inch, ... ..	1	Pins, Draw-bore, Iron, Long, ... ..	1						
							¾ inch, ... ..	1	Planes,	{	Jack, Double, Iron, ... ..	1
											Smoothing, ... ..	1
Trying, ... ..	1											
2 inch, ... ..	1	Skew or Rebate, 1½ inch, ... ..	1									



Planes, { Brad, 4 inch, ... .. 1	Bits for Stocks, {	Shave, Spoke, { Large, 4 inch, ... 1
{ Tothing, ... .. 1		{ Small, 3 inch, ... 1
Pots, Glue, Cast-iron, Double, ... 1		Squares, { Iron, Figured, ... 1
Brush for Glue, ... .. 1		{ Steel-blade, 9 inch, ... 1
Pincers, Carpenters', ... .. 1		Stock, with 33 Bits, ... .. 1
Punches, Wheelers, { Large, ... 1		{ Centre, ... .. 10
{ Small, ... .. 1		{ Countersunk, ... .. 2
Rule, 2-foot Common, ... .. 1		{ Dowling-sash, with Collar, ... 1
Set, Saw, Hand, ... .. 1		{ Gouge, ... .. 9
Saws, { Hand, ... .. 1		{ Nose, ... .. 8
{ Tenon, Iron-back, ... .. 1		{ Rimer, Square, ... .. 1
{ Turning or Compass, ... 1		{ Screw-driver, ... .. 1
{ Rub, Carpenters', 12 inch, 1		{ Taper, ... .. 1
Stones, { Rag, for Scythes, ... .. 1		Wrench-hammer, Small, ... .. 1
{ Oil, ... .. 1		Chest, Tool, Field Service, with Padlock ... .. 1
Screw-drivers, { 14 inch, ... 1	Samson 'ramp, Wheelers',* ... 1	
{ 6 inch, ... .. 1		

\* This is not required with Ring Tires.

**TOOLS FOR SHOEING SMITHS.**

*(To be carried in Forge Waggon.)*

Buffers, ... .. 3	Pritchels, ... .. 3	
Chisels, ... .. 3	Poker, ... .. 1	
Hammers, { Sledge, ... .. 2	Rag-stone, ... .. 1	
	{ Turning, ... .. 1	Rasps, ... .. 6
	{ Shoeing, ... .. 3	Stakes, Pointing, ... .. 2
{ Pointing, ... .. 2	Stamps, ... .. 3	
Knives, Drawing, ... .. 6	Slice, ... .. 1	
Pincers, (pairs), ... .. 2	Tougs, (pairs), ... .. 6	

**No. 4.—MATERIAL FOR REPAIRS FOR COLLAR MAKERS.**

*(To be carried in Store Limber Waggon and Store Cart.)*

Hides, { Buffalo, (half hides), ... 12	Curbs, ... .. 12		
		{ Bullock or Cow,* ... .. 24	{ Cord, Whip, (lbs), ... .. 6
{ Sheep, Dressed, (dozen), 6	Hooks for Sword-belts, † { Front, 12		
{ Buff, ... .. 2		{ Side, ... 12	
Buckles, { 2½ inch, ... .. 6	Wool, (lbs), ... .. 50		
	{ 2 inch, ... .. 12	Oil, gallons), { Neatsfoot, ‡ ... .. 6	
	{ 1½ inch, ... .. 12		{ Native,    ... .. 10
	{ 1¼ inch, ... .. 36	Nails, Tack, (lbs), { No. 50, ½ inch, 4	
	{ 1¼ inch, ... .. 48		{ „ 51, ¾ inch, 4
	{ 1 inch, ... .. 72		{ „ 52, 1 inch, 4
	{ ¾ inch, ... .. 36		{ „ 70, ... .. 2
	{ ¾ inch, ... .. 48		{ „ 71, ... .. 2
	{ ¾ inch, ... .. 24	{ „ 72, ... .. 2	
	{ ¾ inch, ... .. 24	{ „ 73, ... .. 2	
Iron, Tug, 2½ inch, ... .. 6	Plates, Waist, Belt, (pairs), † ... 6		
Brass, for Sword Billets, 1½ inch † 12	Rings for Sword-belts, † ... .. 12		
Bills, Snipe, with Rings, ... .. 24	Rope for Traces, Fathoms, ... .. 20		

\* This must depend on the size. † For Horse Artillery. ‡ In three 2 gallon tins.

|| In five 2 gallon tins or in dubbars.

Thread, (lbs.)	{	Collar, ... .. 15	Wax, Bees', (lbs.), ... .. 10
		Hemp, ... .. 24	
Twine, Quilting,	{	Black, ... .. ½	Russia Duck, (yards), ... .. 30
		Whited-brown, ... 4	
Web, (yards),	{	Diaper, 2 inch, ... 4	Serge, (yards), ... .. 50
		Diaper, 2 inch, ... 12	
Girth,	{	2½ inch, ... 24	Sheepskins, Black, Undressed for repairs, ... .. 6
		3½ inch, ... 12	
		4 inch, ... 12	

## MATERIALS OF REPAIRS FOR SMITHS.

(To be carried in Store Limber Waggon and Store Cart.)

Hooks, Curb, ... .. 200	{	Bolt, ¼ inch, ... .. 28	Iron, (lbs.), {	Square, 1 inch, ... 56
Iron, (lbs.), {		Flat, {		1½ × ½ inch, ... 28
	1 × ½ inch, ... 28	Steel, (lbs.) {	Sheer, 2 × ½ inch 10	
	Hoop, ½ inch, ... 28		Cart, ¾ × ¾ ... 10	
	Rod, Nail, ¾ inch, ... 28		Blister, Flat, 2 × ½ 10	

## MATERIALS FOR REPAIRS FOR WHEELERS.

(To be carried in Store Limber Waggon and Store Cart.)

Bolts, Tire, with Collar,* ... .. 20	{	Nails, Tire, (lbs.), † ... .. 24	
Felloes, Rough, ... .. 12		Spokes, Rough, ... .. 24	
Glue, (lbs.), ... .. 8	Screws, Iron, {	1½ inch, {	No. 207, ... .. 36
Grease Firkins, (18 lbs. each), ... 4		1½ inch, No. 206, ... .. 48	226, ... .. 48
Loops, screwed, spare, ... .. 12	Nails, (lbs.), {	¾ inch, ... .. 48	Stones, Rag, ... .. 2
		No. 32, 1½ inch, ... 6	
Clasp, {	Clout, {	¾ inch, {	No. 203, ... .. 72
		2 inch, ... 8	242, ... .. 72
33, 2 inch, ... 8	Chisel, {	Timber, Teak, 1½ inch, (superficial feet), ... .. 12	Iron Buckles, ... .. 6
39, 2½ inch, ... 8			
56, ... .. 3	61, ... .. 8	Lashing, ... .. 3	Round, Crowned, {
57, ... .. 12	62, ... .. 6	Large, 9	
58, ... .. 9	63, ... .. 15		95, ... .. 6
59, ... .. 12	Brads, {	95, ... .. 6	
61, ... .. 8			95, ... .. 6
62, ... .. 6	95, ... .. 6		
63, ... .. 15		95, ... .. 6	
63, ... .. 15	95, ... .. 6		
95, ... .. 6		95, ... .. 6	

\* If one kind used for Bengal Wheel, but 17 heavy and 50 light for Royal Artillery pattern.

† Not required with Ring Tires.

*Note.*—The above detail of Material for repairs is given as a guide for the proportions of the several articles required for the repairs of a Battery in ordinary conditions for one year, and care must be taken that a sufficient portion of each article is kept on hand to meet the necessary repairs of Carriages, Harness, and other Equipments, so that the Battery may always be in readiness for immediate service.

6-FOUNDER GUN.

1 Carbine.

1 Felling Axe.

1 Swingletree

1 Carbine.

1 Sword

2 Drag-ropes.

1 Bill-hook.

1 Grease-tin in front of Axletree.

1 Sword.

1 Shovel.

24, 1½ lb. Cartridges.	
8 Shrapnell Fuses in Wax-cloth.	
6, ¾ os. Burstern.*	
3 Portfires on Lid.	
6 Solid Shot in lower tier.	2 Shrapnell and 4 Solid Shot in lower tier.
4 Shrapnell and 2 Common Case in upper tier.	6 Solid Shot in upper tier.

1 Prolonge.

1 Funnel.
1 Mallet.
1 Setter.
1 Set of Fuse Im- plementn.
2 Screw Drivers for shell, (two kinds).
1 Spring Punch.
1 Washer.
2 Linch-pins.
2 Couplen.
1 Spare Tangent Screw.
2 Keyn.
Linch-pin ties.
1 Tube-pocket with 50 Tubes, and 2 Lanyards.†

1 Spade.

24, 1½ lb. Cartridges.	
100 Friction Tubes in zinc or tinbox.	
3 Portfires on Lid.	
6 Solid Shot in lower tier.	12 Solid Shot in two tiers.
4 Solid Shot and 2 Common Case in upper tier.	

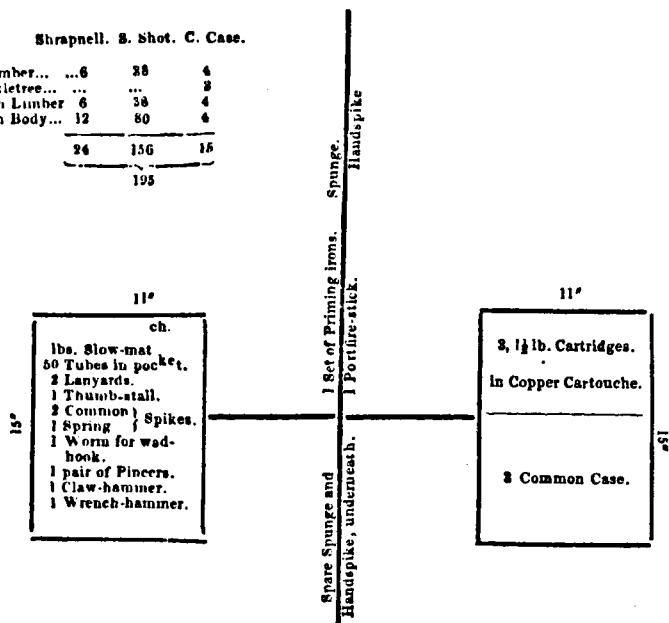
1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Shrapnell. S. Shot. C. Case.

Gun Limber... ..6	28	4
Gun Axletree... ..	...	2
Wagon Limber 6	38	4
Wagon Body... 12	80	4
	<hr/>	
	24	156
		16
	<hr/>	
	195	



\* The quantity of powder in these burstern is calculated for Diaphragm Shell.

† When not in use.

'6-POUNDER AMMUNITION WAGGON.

- 1 Carbine.                      1 Felling Axe.                      1 Swingletree.                      1 Carbine.  
 1 Grease-tin in front of Axletree.                      1 Lifting-Jack.                      1 Bill-hook.  
 2 Drag-ropes.

1 Shovel.

24, 1½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth. 6, ¾ oz. Burstern.* 3 Portfires on Lid.	
6 Solid Shot in lower tier.	2 Shrapnell and 4 Solid Shot in lower tier.
4 Shrapnell and 2 Common Case in upper tier.	6 Solid Shot in upper tier.

- |  |
|--|
| 1 Rammer-head.<br>1 Spunge-head.<br>1 Funnel.<br>2 Screw-drivers, of two kinds.<br>1 pair Fuze Pincers.<br>1 pair Scissors.<br>2 Needles.<br>1 oz. of Worsted.<br>1 Washer.<br>1 Linch-pin..<br>2 Couples.<br>12 Linch-pin tiers.<br>Saw-set and Files.<br>1 Key.<br>1 Laboratory Knife. |
|--|

24, 1½ lb. Cartridges. 100 Friction Tubes in zinc or tin box. 3 Portfires on Lid.	
6 Solid Shot in lower tier.	12 Solid Shot in two tiers.
4 Solid Shot and 2 Common Case in upper tier.	

1 Spade.

1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Spare Wheel.

10 Sets of Horse Shoes in box underneath.  
 5 Sets of nails to each.

6 Solid Shot in lower tier. 2 Common Case and 4 Solid Shot in upper tier.	12 Solid Shot in two tiers.
24, 1½ lb. Cartridges. 50 empty Flannel Cartridges.	

10 Sets of Horse Shoes in box underneath.  
 5 Sets of Nails to each.

Hand-saw in Leather Case.  
 Grease Magazine underneath.

24, 1½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth, 6, ¾ oz. Burstern. 1 Skein Marline.	
6 Solid Shot in lower tier.	2 Shrapnell and 4 Solid Shot in lower tier.
4 Shrapnell and 2 Solid Shot in upper tier.	6 Solid Shot in upper tier.

2 Shrapnell and 4 Solid Shot in lower tier.	6 Solid Shot in lower tier.
6 Solid Shot in upper tier.	4 Shrapnell and 2 Solid Shot in upper tier.
24, 1½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth. 6, ¾ oz. Burstern. 1 Skein Hambro' line.	

10 sets of Horse Shoes in box underneath.  
 5 sets of Nails to each.

24, 1½ lb Cartridges. 50 empty Flannel Cartridges.	
21 Solid Shot in two tiers.	6 Solid Shot in lower tier. 2 Common Case and 4 Solid Shot in upper tier.

2aul.

12-POUNDER HOWITZER.

1 Carbine

1 Felling Axe.

1 Swingletree.

1 Carbine.

1 Sword.

1 Sword.

1 Grease-tin in front of Axletree.

2 Drag-ropes.

1 Bill-hook.

1 Shovel.

16 Shrapnell in two tiers.	16, 1½ lb. Cartridges.
	16, 1½ os. Burstern.*
	26 Shrapnell Fuzes in Wax-cloth.
3 Portfires on Lid.	2 Shrapnell.

1 Leather Water-bucket.

1 Prolonge.

1 Funnel.
1 Mallet.
1 Setter.
1 Set of Fuzer Imple-ments.
2 Screw Drivers for Shell, (two kinds).
1 Washer. Ⓞ
2 Linch-pins.
2 Couples.
1 Spare Tangent Screw.
12 Linch-pin ties.
2 Keys.
1 Spring Punch.
1 Tube-pocket with 50 Tubes, and 2 lanyards.†

1 Pickaxe.

16, 1½ lb. Cartridges.	8 Common Shell in two tiers.
16 Common Fuzes in Wax-cloth.	4 Common Shell in lower tier.
100 Friction Tubes in zinc or tin box.	2 Common Shell and 2 Common Case in upper tier.
14, 6 os. Burstern.	3 Portfires on Lid
2 Common Case.	

1 Spade.

1 Leather Water-bucket.

	Shrapnell.	C. Shell.	C. Case.	Carcass.
Gun Limber	18	16	4	...
Gun Axletree	...	...	3	...
Waggon Limber	18	16	4	...
Waggon Body	26	26	4	4
	72	86	18	4
	147			

15"

11"
lbs. Slow-match.
50 Tubes in pocket.
2 Lanyards.
1 Thumb-stall.
2 Common } Spikes.
1 Spring }
1 Worm for Wad-hook.
1 pair of Pincers.
1 Claw-hammer.
1 Wrench-hammer.

Spare Sponge and Handspike, underneath.

Sponge. Handspike.

1 Set of Priming-irons.

1 Portfire-stick.

15"

11"
8, 1½ lb. Cartridges.
8 Common Case.

15"

\* The quantity of powder in these burstern is calculated for Diaphragm Shell.

† When not in use.

12-POUNDER HOWITZER AMMUNITION WAGGON.

1 Carbine.

1 Felling Axe.

1 Swingletree.

1 Carbine.

1 Grease-tin in front of Axletree.

1 Lifting-jack.

2 Drag-ropes.

1 Bill-hook.

1 Shovel.

16 Shrapnell in two tiers.	18, 1 1/2 lb. Cartridges.
	18, 1 1/2 oz. Burstera.*
	24 Shrapnell Fuzes in Wax-cloth.
3 Portfires on Lid.	2 Shrapnell.

1 Rammer-head.
1 Spunge-head.
1 Funnel.
2 Screw-drivers for Shell (two kinds.)
1 pair Pincers.
1 pair Scissors.
2 Needles.
1 oz. of Worsted.
1 Washer.
1 Linch-pin.
2 Couples.
12 Linch-pin ties.
Saw-set and Files.
1 Key.
1 Laboratory Knife.

18, 1 1/2 lb. Cartridges.	8 Common Shell in two tiers.
14, 6 oz. Burstera.	
16 Common Fuzes in Wax-cloth.	4 Common Shell in lower tier.
100 Friction Tubes in zinc or tin box.	2 Common Shell and 2 Common Case in upper tier.
2 Common Case.	3 Portfires on Lid.

1 Spade.

1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Spar Wheel.

10 sets of Horse shoes in box underneath.  
5 sets of Nails to each.

4 Carcases in lower tier.	2 Common Shell.
4 Common Shell in upper tier.	18, 1 1/2 lb. Cartridges.
	14, 6 oz. Burstera.
6 Common Shell in two tiers.	24 Common Fuzes in Wax-cloth.
	50 Empty Flannel Cartridges.

2 Shrapnell.	16 Shrapnell in two tiers.
18, 1 1/2 lb. Cartridges.	
18, 1 1/2 oz. Burstera.	
16 Shrapnell Fuzes in Wax-cloth.	16 Shrapnell in two tiers.
1 Skein Hambro' Line.	

10 sets of Horse Shoes in box underneath.  
5 sets of Nails to each.

Hand-saw in Leather Case.  
Grease Magazine underneath.

16 Shrapnell in two tiers.	18, 1 1/2 lb. Cartridges.
	18, 1 1/2 oz. Burstera.
	16 Shrapnell Fuzes in Wax cloth.
	1 Skein Marline.
16 Shrapnell in two tiers.	2 Shrapnell.

18, 1 1/2 lb. Cartridges.	8 Common Shell in two tiers.
14, 6 oz. Burstera.	
24 Common Fuzes in Wax-cloth.	
50 Empty Flannel Cartridges.	4 Common Shell in lower tier.
2 Common Case.	2 Common Shell and 2 Common Case in upper tier

10 sets of Horse Shoes in box underneath.  
5 sets of Nails to each.

Maul.

## 9-POUNDER GUN.

1 Carbine.

1 Felling Axe.

1 Swingletree.

1 Carbine.

1 Grease-tin in front of Axletree.

1 Bill-hook.

2 Drag-ropes.

1 Prolonge.

1 Funnel.  
 1 Mallet.  
 1 Setter.  
 1 Set of Fuze Imple-  
 ments.  
 2 Screw Drivers for  
 Shell, (two kinds)  
 1 Spring Punch.  
 1 Washer.  
 2 Linch pins.  
 2 Couplers.  
 1 Spare Tangent  
 Screw.  
 2 Keys.  
 12 Linch-pin ties.  
 1 Tube-pocket with  
 50 Tubes and 2  
 Lanyards. †

16, 2½ lb. Cartridges.

100 Friction Tubes in Zinc  
 or Tin Box.

3 Portfires on Lid.

6 Solid Shot in lower tier.

6 Solid Shot and 2 Common Case.  
 in upper tier.

1 Shovel.

16, 2½ lb. Cartridges.

3 Shrapnell Fuzes in Wax-cloth.

6, 1½ oz. Burstera.\*

3 Portfires on Lid.

6 Solid Shot and 2 Shrapnell in lower tier.

6 Shrapnell, 2 Solid Shot, and 2 Common Case in upper tier.

1 Spade.

1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Shrapnell. S. Shot. C. Case.

Gun Limber,.....	6	22	4
Gun Axletree....	...	...	3
Waggon Limber....	6	22	4
Waggon Body....	12	48	4
	24	92	15
	131		

12½"  
 15"  
 lbs. Slow-match.  
 50 Tubes in pocket.  
 2 Lanyards.  
 1 Thumb-stall.  
 2 Common } Spikes.  
 1 Spring }  
 1 Worm for wad-hook.  
 1 pair of Pincers.  
 1 Claw-hammer.  
 1 Wrench-hammer.

Spunge.  
 Handspike.  
 1 Set of Priming irons.  
 1 Portfire-sick.  
 Spare Spunge and  
 Handspike, underneath.

12½"  
 15"  
 3, 2½ lbs. Cartridges in metal Cartouche.  
 3 Common Case.

\* The quantity of powder in these burstera is calculated for Diaphragm Shell.

† When not in use.

## 9-POUNDER AMMUNITION WAGGON.

1 Carbine.

1 Felling Axe.

1 Swingletree.

1 Carbine.

1 Lifting-jack.

1 Grease-tin in front of Axletree.

2 Drag-ropes.

1 Bill-book-

1 Shovel.

16, 2½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth. 6, 1½ oz. Burstern.* 3 Portfires on Lid.
6 Solid Shot and 2 Shrapnell in lower tier.
4 Shrapnell, 2 Solid Shot, and 2 Common Case, in upper tier.

1 Rammer-head. 1 Spunge-head. *1 Funnel. 2 Screw-drivers for Shell (two kinds.) 1 pair Pincers. 1 pair Scissors. 2 Needles. 1 oz. of Worsted. 1 Washer. 1 Linch-pin. 2 Couples. 12 Linch-pin ties. Saw-set and Files. 1 Key. 1 Laboratory Knife.
--

16, 2½ lb. Cartridges. 100 Friction Tubes in Zinc or Tin Box. 3 Portfires on Lid.
8 Solid Shot in lower tier.
6 Solid Shot and 2 Common Case in upper tier.

1 Spade.

1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Spare Wheel.

10 Sets of Horse Shoes in box underneath.  
5 Sets of Nails to each.

8 Solid Shot in lower tier. 6 Solid Shot and 2 Common Case in upper tier.
16, 2½ lb. Cartridges. 50 Empty Flannel Cartridges.

Hand-saw in Leather Case.  
Grease Magazine underneath.

16, 2½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth. 6, 1½ oz. Burstern. 1 Skein of Marline.
6 Solid Shot and 2 Shrapnell in lower tier.
4 Shrapnell and 4 Solid Shot in upper tier.

6 Solid Shot and 2 Shrapnell in lower tier. 4 Shrapnell and 4 Solid Shot in upper tier.
16, 2½ lb. Cartridges. 8 Shrapnell Fuzes in Wax-cloth. 6, 1½ oz. Burstern, 1 Skein Hambro' Line.

16, 2½ lb. Cartridges. 50 Empty Flannel Cartridges.
8 Solid Shot in lower tier.
6 Solid Shot and 2 Common Case in upper tier.

10 Sets of Horse Shoes in box underneath.  
5 Sets of Nails to each.

A.sul.



24 -FOUNDER HOWITZER.

1 Carbine.

1 Felling Axe.

1 Swingletree

1 Carbine.

1 Grease-tin in front of Axletree.

2 Drag-ropes.

1 Bill-hook.

1 Shovel.

12, 2 lb. Cartridges.
16 Shrapnell Fuzes in Wax-cloth.
12, 2 oz. Bursterns.*
12 Shrapnell Shell in two tiers.
3 Portfires on Lid.

1 Prolonge.

1 Funnel-
1 Mallet.
1 Setter.
1 Set of Fuze Im-
plements.
2 Screw Drivers for
Shell, (two kinds).
1 Spring Punch.
1 Washer.
2 Linch-pins. †
2 Couplies.
1 Spare Tangent
Screw.
2 Keys.
Linch-pin ties.
1 Tube-pocket with
50 Tubes.

Spade.

12, 2 lb. Cartridges.
100 Friction Tubes in zinc or Tin
Box.
10, 13 oz. Bursterns.
16 Common Fuzes in Wax-cloth.
6 Common Shell in lower tier.
4 Common Shell and 2 Common
Case in upper tier.
3 Portfires on Lid.

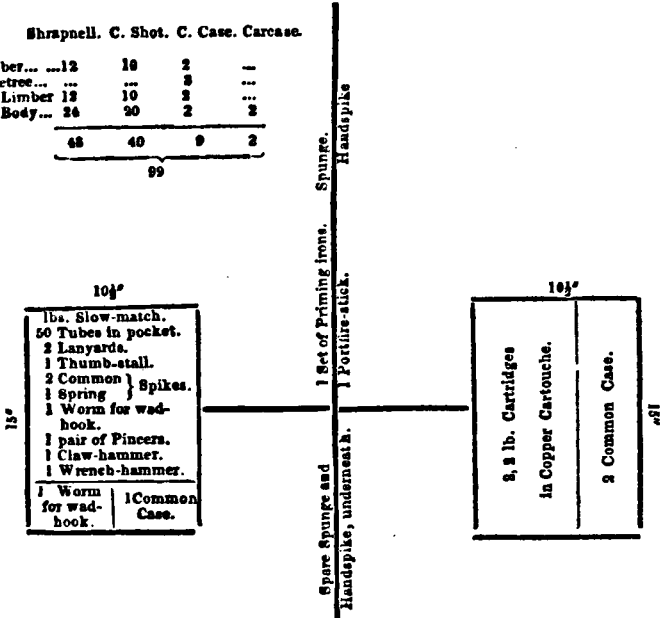
1 Leather Water-bucket.

1 Pickaxe.

1 Leather Water-bucket.

Shrapnell. C. Shot. C. Case. Carcase.

Gun Limber... ..	12	16	2	—
Gun Axletree... ..	...	...	3	...
Waggon Limber	12	10	2	...
Waggon Body... ..	24	20	2	2
	48	40	9	2
	99			



\* The quantity of powder in these bursterns is calculated for Diaphragm Shell.

† When not in use.

24-POUNDER HOWITZER WAGGON.

1 Carbine.

1 Felling Axle.

1 Swingletree.

1 Carbine.

1 Grease in front of Axletree.

1 Lifting-jack

1 Bill-hook.

2 Drag-ropes.

1 Shovel.

12, 2 lb. Cartridges.  
12, 3 oz. Burstern.  
16 Shrapnell Fuzes in Wax-cloth.

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12 Shrapnell Shell in two tiers.  
3 Portfires on Lid.

1 Leather Water-bucket.

1 Rammer-head.  
1 Spunge-head.  
1 Funnel.  
3 Screw-drivers, for Shell (two kinds.)  
1 pair Fuze Pincers.  
1 pair Scissors.  
2 Needles.  
1 oz. of Worsted.  
1 Washer.  
1 Linch-pin..  
2 Couples.  
12 Linch-pin ties.  
Saw-set and Files.  
1 Key.  
1 Laboratory Knife.

1 Pickaxe.

12, 2 lb. Cartridges.  
10, 13 oz. Burstern.  
16 Common Fuzes in Wax-cloth.

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6 Common Shell in lower tier.  
4 Common Shell and 2 Common Case in upper tier.

1 Leather Water-bucket.

Spare Wheel.

10 sets of Horse Shoes in box underneath.  
5 Sets of nails to each.

4 Common Shell and 2 Carcasses  
in lower tier.  
6 Common Shell in upper tier.

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12, 2 lb. Cartridges.  
50 empty Flannel Cartridges.  
10, 13 oz. Burstern.

10 sets of Horse Shoes in box underneath.  
5 sets of Nails to each.

12 Shrapnell Shell in two tiers.

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12, 2 lb. Cartridges.  
12, 3 oz. Burstern.  
1 Skein Hambro' line.

Hand-saw in Leather Case.  
Grease Magazine underneath.

12, 2 lb. Cartridges.  
12, 3 oz. Burstern.  
1 Skein Marline.

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12 Shrapnell in two tiers.

10 sets of Horse Shoes in box underneath.  
5 sets of Nails to each.

12, 2 lb. Cartridges.  
10, 13 oz. Burstern.  
50 empty Flannel Cartridges.

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6 Common Shell in lower tier.  
4 Common Shell and 2 Common Case in upper tier.

Maul.

It is recommended that a valise be substituted for the Knapsack issued to Gunners of Foot Artillery in this country. The kits of the men are carried when on the line of march in India, either on camels or in carts, and the Knapsacks are constantly getting broken and destroyed; Valises would be much more convenient for this purpose. Although the kits are carried as above stated, it is still desirable that Batteries should, when on the march and frequently at other times, be equipped in marching order; and on such occasions inconvenience is often much felt in the Royal Artillery from the Gunners and Drivers being differently equipped—the former having Knapsacks, while the latter are supplied with Valises. In the event of a Driver falling sick, and his place being taken by a Gunner, it becomes necessary to make them exchange their articles, in order that the Gunner, while acting as Driver, may be able to turn out his horses in marching order. Such a change is of course objectionable, and should be avoided if possible. This would be at once done by the substitution of Valises, as proposed; and as the Soldier never carries his kit himself in this climate, there does not appear to the Committee to be that objection to the change that might be thought to exist in England.

#### GUNPOWDER.

In the Appendix will be found the proceedings of a Committee assembled at St. Thomas' Mount, by order of His Excellency Sir P. Grant, to investigate and report upon the quality and mode of manufacture of the Gunpowder used in the Madras Presidency.

This subject is one of the greatest importance, and the recent improvements in fire-arms, such as the substitution of the Enfield Rifle for the old Musket, increase the necessity for greater care and skill in the manufacture of the powder, in order to ensure uniformity in its strength, and that the Service may derive the full benefit of the advance which science has made in the construction of implements of war.

The durability of Gunpowder is also a most important consideration, not only as any deficiency in this respect must affect its strength and regularity of explosive power, but a considerable saving may be effected by improving its quality as regards its power of resisting the effects of atmospheric moisture, and of bearing transport without injury. It will be seen by a perusal of the proceedings of the Madras Committee, that the proportions of the ingredients even are not the same in all the powders made in this country for the use of Her Majesty's Forces, and the Tables which are appended show a considerable inferiority in the strength of the powder manufactured in Bengal and Madras, as compared with that of Waltham Abbey; it would probably also be found that the latter powder surpasses, to a still greater extent, that of India, as regards its durability, owing to the greater care and skill employed in its manufacture. The Bombay Powder, in point of strength, appears to be good. In this country, a few months only in the year, when no rain is likely to fall, are available for the manufacture of Gunpowder, and as during that time a certain number of barrels have to be made, it becomes necessary to carry on the operation during the night as well as the day; but except in cases of emergency, this should be avoided, as the powder cannot fail to imbibe a considerable quantity of moisture from the heavy dews of the night, which the imperfect means of drying, by exposure to the sun only, is unable to remove, and powder thus made must be of inferior quality. To obviate the necessity of working at night, a considerable increase to the establishments would be required, unless the difficulty was overcome by the importation and use of more extensive machinery, and the adoption of artificial means of drying, these however would not only enable a larger quantity to be made, but tend materially to improve its quality. The Committee are of opinion that the proportion of ingredients should be the same in all manufactories. The purity also of these ingredients is of course most essential for the production of good

powder, and no means or expense should be spared to procure them of the very best quality. Increased incorporation, which is perhaps the most important process in the manufacture of Gunpowder, can only be obtained by machinery, and the Committee consider that expense would be well incurred for this purpose, in order that the best description of powder may be produced, and to ensure uniformity and regularity in the explosive power. Another very important process in the manufacture of Gunpowder is that of drying, and it is recommended that rooms be constructed for the purpose, to be heated by artificial means; the sun alone is insufficient to ensure that perfect dryness which is so essential, and especially in those manufactories under the influence of breezes from the sea. One of the results of using inferior powder is the fouling of the Rifle, a most serious inconvenience, which no means should be left untried to prevent, and the less moisture is absorbed by the powder, and the more perfect its combustion, the less will this be the case. The durability of powder will be much increased by "Glazing," a process which is carried to considerable perfection at Waltham Abbey; it enables the powder to resist the effects of atmospheric moisture to a great extent, and so far also produces regularity in burning. The Committee beg to urge upon Government the importance of this subject, and the advantages which will be derived from the use of machinery, and the employment of greater skill in the Gunpowder manufacture.

#### DRILLS AND EXERCISES.

It is essential that similarity should exist throughout the Service as regards drills and exercises, and it is scarcely necessary to add that those approved by His Royal Highness the Commander-in-Chief for the Royal Artillery should be universally adopted.

The Committee beg to remind the Government of the change that has recently been made in the Royal Artillery

as regards the terms used to designate certain portions of the Corps, the terms Brigade and Battery having been substituted for Battalion and Troop or Company, and they feel that inconvenience is likely to arise if different appellations are continued in the two Services.

There is another point to which the Committee beg to call the attention of Government. It has hitherto been the custom in India for all Ordnance mounted in Forts to be in charge of the Commissary of Ordnance; in consequence of this arrangement, it is necessary for the Officer Commanding the Artillery to ask permission to use the Guns, and to borrow the Side Arms and Small Stores, almost daily for Drill purposes, and the Ordnance themselves are frequently not in such perfect order as they should be, the Commissaries have quite enough to attend to in their own Departmental duties; to obviate this inconvenience it is recommended that all Ordnance in position and mounted in Forts with all Stores necessary for their service and a small quantity of Ammunition, to be kept in expense Magazines, together with the requisite Machines and material for mounting and dismounting or shifting the Ordnance. shall in future be in charge of the Officer Commanding the Artillery at the Station.

#### MINUTE BY COMMITTEE.

On re-consideration the Committee are of opinion that they have understated the Establishment of Artificers necessary for the Royal Artillery, and now recommend that the following Native Establishment be added to Details, pp. 3, 7, 10, and 12, and Tables, pp. 8 and 13, viz:—

4 Smiths, for working at forge, making horse-shoes, nails, &c.  
 2 Meechies,  
 2 Carpenters.

The pay of these men to be—

Smiths,.....	Rupees 7 0 0,	per month.
Meechies,.....	„ 8 0 0,	„
Carpenters,.....	„ 10 0 0,	„

The whole to be paid by Government, unless the Contract for Harness and Carriages be drawn by the Officer Commanding, when the two Moochies and two Carpenters should be paid out of these allowances.

This additional establishment will of course cause a slight increase to the expense of the Batteries, but it will still be less than that of the present establishment of Artificers of the Royal Artillery.

The Committee would also remark with regard to the Native Establishment proposed for Batteries in the foregoing Details, that the Service will be benefitted if the full complement of Syces be at all times maintained, notwithstanding a few of the horses become non-effective; great inconvenience having resulted from discharging these men when the number of horses is reduced by death or other causes, and when the Battery is again completed to its proper strength other syces have to be engaged, who are not only frequently difficult to procure, but who are likely to be but indifferently trained, and have to be taught their work.

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The Committee terminated their Proceedings on the 8th September 1860, having continued their sittings from time to time since the 28th December 1859, with certain interruptions which the absence of some of the Members on other necessary duties rendered unavoidable.

(Signed)	GEO. BARKER, Colonel, Royal Artillery, <i>President.</i>	
„	C. HOGGE, Colonel, Bengal Artillery,	} <i>Members.</i>
„	A. HUYSHÉ, Lt. Col., Bengal Horse Arty.	
„	E. PRICE, Lt. Col., Royal Horse Artillery.	
„	E. B. JOHNSON, Lt. Col., Bengal Artillery.	
„	A. CALVERT, Captain, Royal Artillery, <i>Secretary.</i>	

*Meerut, 8th September 1860.*

Appendix to Report of Proceedings of a  
Special Committee of Artillery Officers  
assembled at Meerut, December 1859—  
September 1860.

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APPENDIX—A.

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No. —.

A

*Adjutant General's Office, Head Quarters,  
Camp, Meerut, 26th December 1859.*

SIR,

With reference to General Orders by the Commander-in-Chief, of the 16th Ultimo, directing the assembly of a special Committee for the purpose of considering the question of details as to the necessary strength and equipment of Field Batteries, and Troops or Companies of Artillery, serving in this country, I have the honor to transmit herewith a copy of a Memorandum of instructions drawn up by order of the Commander-in-Chief for the guidance of the Committee in question, of which you are the Presiding Officer.

I have the honor to be,

Sir,

Your most obedient Servant,

D. M. STEWART, Lieut. Col.,  
*Assistant Adjutant General of the Army.*

*To Colonel Sir G. Barker, K. C. B., Royal Artillery,  
President of Special Committee, Meerut.*



## BY ORDER OF THE COMMANDER-IN-CHIEF.

MEMORANDUM BY THE CHIEF OF THE STAFF, OF INSTRUCTIONS FOR THE ARTILLERY COMMITTEE OF WHICH SIR GEORGE BARKER, K. C. B. IS PRESIDENT.

*Army Head Quarters, Camp, Haupper,  
18th December 1859.*

The Committee of which Sir George Barker is President, will have the goodness to Report as follows:—

1st—With regard to the requirements of Indian Warfare, what should be the strength in Officers, Non-Commissioned Officers, Men, and Horses, for a Troop of Horse Artillery of six pieces, on the detached or Royal Artillery System. The statement to include Store Lascars, Servants, &c.

2nd—A similar statement regarding a Troop of Horse Artillery on the Bengal System.

3rd—A similar statement regarding a Field Battery with European Drivers.

4th—For a Reserve or Garrison Company, to which a Heavy Field Battery is liable to be attached.

5th—To report whether the Bengal Nine Pounder Gun is sufficient for Field Artillery purposes in India.

6th—To make a *Special Report* on the Royal Artillery Carriages, shewing the results that have been obtained from their use, in wear and tear, &c., &c. and stating whether it is expedient again to recur to the importation of Carriages from England.

7th—To report on the whole question of *equipment*; and as to whether it is expedient to import all equipment from England, or to rely in part on the native manufacture.

8th—Opinions may be gathered from various quarters, and stated at length on the *Contract System*, as adopted in the

Bengal Artillery, or the *Store System*, belonging to the Royal Artillery.

9th—With respect to the statements required in the first four paragraphs, and No. 8 of this paper, the financial results must be carefully brought out, as compared with the expenditure incurred by the State in present Establishments in the Royal Artillery, and in the Artillery Regiments of the three Presidencies.

10th—The Committee is empowered to call for information from the Ordnance Departments of the various Presidencies ; from the Commandants of the different Regiments ; and from any other quarter in which it may be convenient to make enquiries.

11th—The Committee is invited to remark on any points of organization and equipment of Artillery, which may occur to them as worthy of note or suggestion ; though omitted in the above instructions.

12th—It is reminded that, in making its recommendations, it should be guided by the necessity of maintaining as much economy as is compatible with real efficiency ; attention being paid to the Character of Indian War, as compared with the greater requirements of of an European Contest.

(True Copy.)

D. M. STEWART, Lieut. Colonel,

*Assistant Adjutant General of the Army.*

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No. 1.

*Army Head Quarters, Camp, Delhie,*

*3rd January 1860.*

SIR,

In answer to your letter, dated Meerut 2d January 1860. I am desired to say that the Commander-in-Chief considers that the question of the strength of Brigades and Batteries of

Artillery should be considered by the Committee, of which you are President, as forming part of the general Subject of Artillery on which you will have to Report.

2. You will not forget also to Report upon Depots of Instruction, that part of the Subject being included in the last Paragraph of your Original Instructions.

3. His Excellency has given orders that Captain Calvert may be appointed a Member of your Committee.

I have the honor to be,

Sir,

Your most obedient Servant,

W. M. MANSFIELD, Major General,  
*Chief of the Staff.*

*Sir George Barker, K.C.B.,  
Commandant of Royal Artillery in Bengal.*

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#### APPENDIX—B.

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*Meerut, 29th December, 1859.*

SIR.

I have the honor to forward a copy of Instructions issued by order of His Excellency the Right Honorable Lord Clyde, Commander-in-Chief, for the guidance of a Committee of Artillery Officers assembled under instructions from the Government, for the consideration of subjects connected with the Organization, Detail, and Equipment of Artillery for Service in India, with a view to one uniform system being adopted in the three Presidencies; you will observe that the Committee is empowered to call for information from the Head Quarters of the Artillery at Madras and Bombay, as also from any other Departments they may think necessary. The Committee assembled for the first time on the 28th December, and

request you will have the goodness to cause the following information to be furnished to them.

1.—What is the Establishment of Officers, Non-Commissioned Officers, Men, Horses, and Natives of all denominations for a Troop of Horse Artillery in the Madras and Bombay Presidencies.

2.—What is the Establishment of a Field Battery, whether with European or Native Drivers.

3.—What is the Establishment of a Reserve or Garrison Company, to which a Heavy Field Battery is liable to be attached.

4.—The Committee request, that each Detail may be accompanied by a statement showing the pay of each Individual in the Establishment, and the whole expense incurred by Government for one month.

5.—With regard to para. 8 of the Instructions, the Committee request information as to the mode of keeping the Equipment of Batteries in repair, and the Horses shod up, whether by a contract allowance to the Commanding Officer or by the stores being issued from Magazines; if the former, what are the rates of allowances.

6.—As to the nature of small arms, in use both with Gunners and Drivers, whether of Horse Artillery, Field Batteries, or Garrison Companies, the number of Carbines, &c., with each, and amount of Ammunition carried.

7.—The Committee will esteem it a favor if you will forward to them the above information at your earliest convenience, and will be glad of any suggestions upon the subjects under their consideration which you may think likely to assist them in arriving at a satisfactory decision.

8.—With regard to para. 5 of this letter, the Committee request information as to the source of supply, whether from England or from Native Establishments, of Harness and

Equipment generally, the expense of each article, its weight and durability.

I have, &c.,

(Signed) GEO. R. BARKER,  
Colonel and President.

*To the Commandants of Artillery  
in Madras and Bombay.*

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No. 265.

*To Col. Sir G. Barker, K.C.B., Royal Artillery,  
President, Special Committee on Artillery, &c., Meerut.*

SIR,

As requested in your letter dated Meerut 29th December 1859, I do myself the honor of forwarding, as briefly as possible, the information you desire:—

1st.—The Establishment of a Troop of Horse Artillery, marked A.

2nd.—The Establishment of a Field Battery of Foot Artillery, marked B.

3rd.—The Establishment of a Reserve Company of Foot Artillery, marked C.

4th.—The Establishment of Native Drivers, Horse Field Battery, marked D, and a statement showing the whole expense incurred by Government monthly for their maintenance, as a component part of each.

5th.—A statement showing the Small Arm equipment of Troops of Horse Artillery and Light Field Batteries, as also that of a Reserve Company, marked E.

Shoeing Horses.

2. With reference to para. 5 of your letter, I beg to state that the Horses of Troops and Batteries are shod by the Farriers, who are paid by Government (*vide* Table); that Shoes and Nails are provided by the Captain from the Troop Contract *vide* PaY Tables; and that Farriers find their own Tools.

Repairs of Arms  
and Carriages.

3. All repairs of Arms and Carriages are executed on the Store system; that is, Troop and Company Commanding Officers execute all minor repairs, and Commissaries of Ordnance any more extensive ones; materials for minor repairs are obtained from Arsenals on Indent, and a half-yearly allowance of Petty Stores is allowed for repairs of Arms and Accoutrements. Should a Battery be within three miles of an Arsenal, its carriages, &c., are sent there for repairs, one set of (or half) the Artificers being under the orders of the Commissary to be available for that purpose. If no Arsenal is at hand, Contingent Bills are forwarded on account of any repairs required.

Source of Supply of Saddlery and Harness.

4. The supplies of leather for making up the Saddlery and Harness of Horse Artillery and Foot Batteries are obtained in the country, the hides being purchased in the bazaars, tanned and dressed under Regimental arrangement, or purchased ready tanned wherever procurable. Every article, whether of iron or leather, is made up in Regimental Stores, and at prices shewn (in Statement F.); as also period of durability of each article with its weight; that Statement represents the average cost of the three years 1857, 1858, and 1859, and is much higher than that of three previous, or any former years, owing to price of raw material having risen:—

1st.—The period of durability is estimated for Garrison duties or marching for ordinary relief, but on Service, exposed to vicissitudes of climate and weather, it would doubtless be less, and by one-third probably. I would here mention that the Drivers having the same Saddle and Bridle as other ranks, the weight of these articles is not included in that of the set of Harness.

2nd.—If English Leather could be procured it would be far superior to anything tanned in India, and though more expensive at first, it would be cheaper in the end from its greater durability. Workmanship is however much cheaper in India than in England, and very good; the material might

be worked up as required. But I would strongly urge the advisability of having all Iron work from England, as with all its cost of making up and freight to this Country, it will be infinitely cheaper and more satisfactory than anything we can get out here.

5. The Special Board of Artillery Officers assembled at Calcutta in July 1836, (the Proceedings of which are doubtless before the Committee of which you are President,) entered very fully into all questions in connection with the Organization and Equipment deemed best suited for Indian Artillery. Opinions have doubtlessly undergone much change since that time on many points, and the improvements which have taken place have rendered many things then in use at each, or either Presidencies, obsolete. Still I think very much may be gathered from a perusal of those proceedings, calculated to assist your Committee in arriving at a just decision on questions affecting the Indian Artillery.

6. It seems to me that the strength of Strength of Troops and Companies. Royal Troops and Companies is unnecessarily great and expensive, whilst that of the Indian Service is totally inadequate to the service it is expected to perform. The experience of the last few years must have demonstrated this particularly, though it was a well recognized fact before. A medium strength would, I believe, answer all purposes thoroughly.

1st.—For a Troop of Horse Artillery on the Detachment system, I would suggest as follows:—

1 Captain.	6 Corporals.
1 2d Captain.	1 Drill Corporal (Non-effective.)
3 Lieutenants.	12 Bombardiers.
1 Assistant Surgeon.	2 Rough Riders (Non-effective.)
1 Troop Quarter Master.	3 Farriers.
1 Troop Sergeant Major.	3 Shoeing Smiths.
1 Troop Quarter Master Sergt.	120 Gunners.
6 Sergeants.	230 Horses.
2 Trumpeters.	Horse-keepers and Grass-cutters in
2 Half-pay Trumpeters.	same proportion as at present.

2nd. If Government keep up so expensive an arm as Horse Artillery, it should not stop short of efficiency, and I think the strength I have named to be the lowest to attain that end.

3rd—The strength of *personnel* of a Company which is to have a Battery attached, I would suggest being the same as that of a Troop, omitting one of the Rough Riders, substituting a Staff Sergeant for the Troop Quarter Master, and allowing 142 as the number of horses; and both for it, and the Horse Artillery, I think the Gunner and Driver preferable to the separate system for these classes.

4th—A Reserve Company might, I think, be composed as follows:—

1 Captain.	6 Corporals.
3 Lieutenants.	6 Bombardiers.
1 Sergeant Major.	2 Buglers.
1 Quarter Master Sergeant.	90 Gunners.
6 Sergeants.	

Artificers. 7. I think should be mainly European, unless the present scale of wages is much raised, for no really good Artificer will now stay with a Troop or Company, or if they do in Garrison, where family ties may attach them to the Service, they desert you the moment you march, and leave you at the time you are so likely to require their services.

Arms, Drill and Exercise. 8. On this subject I cannot better convey my idea than by subjoining a copy of letter I have very recently addressed to the Adjutant General of the Madras Army on it:—

No. 91.

*To the Adjutant General of the Army, Fort Saint George.*

SIR,

I have the honor to request that you will bring to the notice of His Excellency the Commander-in-Chief, that under



## MISCELLANEOUS.

1861.

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### Care and Feeding of Cavalry and Artillery Horses in India.

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*January 1861.*

There are in my opinion several objections to the system at present in force in India, as to the care and feeding of Cavalry and Artillery Horses, and I have collected the evidence and opinions of various Officers upon the subject, extracts of which are appended to this report.

The system at present is as follows.—The Horses are picketed in open lines all the year round. With the exception of a coarse native blanket, they have no cover, and are consequently exposed perpetually to all the vicissitudes of climate; to alternate tropical heat, heavy rains, cold winds, dust, insects &c.—Their forage consists of gram, and of grass cut daily; they eat the former out of nose bags and the latter off the ground. In the Madras Presidency, 4lbs. of hay or straw per diem are allowed for each horse for bedding, but this is only given for 6 months in the year, and is mixed with any spare grass that may be left.

I think there are several great objections on the very face of such arrangements as those above described. The constant exposure of the horses to every vicissitude of a treacherous climate, is very injurious to their condition. No animal if left to itself would remain all day in the sun; some Veterinary Surgeons are of opinion that horses thereby

contract liver complaints. In the rains the matter becomes worse; they fall off in condition, and they stand in mud, thereby contracting diseases of the feet; their grass becomes saturated with rain and mud. The want of shelter however is not injurious to the horses alone; it materially affects the health of the European Soldiers also. These latter must either neglect their stable duties, or else must suffer from over exposure. At the present time no soldier attends midday stables. It is impossible to do so, as long as the horses are picketed in the open air.

Instead of erecting cover, the expedient hitherto adopted has been to endeavour to save the Europeans, by allowing a large proportion of horse keepers, to help them to do their work; a bad and an expensive make-shift. As far as I can ascertain, good open sheds could be erected for about 60 Rupees per horse, although the estimate of the Engineer Officers I am aware is higher. Pillars of brick supporting a tiled roof would be sufficient; with good drainage. The small expenditure necessary to build these sheds, would be recovered almost immediately, in the improved health of the men and horses, and in a reduction of the horse keepers, which could then be safely made.

The system of feeding the horses is as objectionable as the want of shelter. They should eat their gram out of mangers, and their grass or hay out of racks. Nose bags are all very well on a march, or in cases of necessity, but they are not comfortable things, and also expensive if used constantly. Owing to the grass being laid upon the ground, it blows away in windy weather, and gets dirty in the rains; and Veterinary Surgeons are of opinion that some horses die from inflammation, caused by swallowing so much gravel. The grass being cut daily by the grass cutters, and the horses having little or no hay, it follows that at one season of the year (during the rains) they get too much green food, and in the others the grass is dry, perished, and often of very infe-

rior quality. All the evidence I have collected, goes to shew that grass grows freely all over the country; that if the slightest attention were paid to the subject, and if encouragement were held out to the native ryots, hay could be obtained in any quantities, made at the proper season, just after the rains. The ordinary Rumnah grass makes very fair hay, and is very cheap; Hurrialles is of course far better, but dearer. A mixture of both, would perhaps be the best ration for the horses, which latter should also receive a certain proportion of green grass, when it can be got.

If the system of giving the horses a ration of hay were adopted, the greater number of the grass cutters could be dispensed with, and thus the two classes of followers (horse-keepers and grasscutters) who now abound in Cavalry and Artillery lines, who are very expensive, and a perfect nuisance, would in a great measure be done away with. Whatever is the arrangement however decided upon, as to foraging Artillery and Cavalry horses, I am of opinion, that the responsibility of all supplies, should rest with the Commissariat. They are the proper Officials to undertake all such duties; and the present system, of hampering every Captain of a Troop or Battery, with the charge and payment of a heap of grass cutters, is simply transferring Commissariat duties to Regimental Officers, which latter have quite enough occupation already.

The bedding of the horses is quite insufficient; instead of lying down each night in comfortable cool straw, they roll about in gravel, get rubbed and covered with dirt, and never look well in their coats. There is in my opinion, great inconsistency, in going to enormous expense to build handsome barracks for the Men, such as those now erecting at Bangalore, Secunderabad, and elsewhere, and after all this expenditure to make no provision for the horses; so that the soldiers are exposed all the time they are grooming, and in going to and from the lines.

*The following are Extracts from the opinions of various Officers upon the cultivation of Indian grasses and also upon the advisability of erecting cover for Horses.*

Mr. Pritchard, Veterinary Surgeon, to the Governor's Body Guard,

MADRAS 1855.

Says that Hurriallee is the best, and most nutritious grass. Advocates Rumnah land being allotted to Regiments,—Says that at Bangalore Hurriallee is 64lbs. the Rupee; that about 4 Cawnies ought to yield hay for 100 horses for 6 Months in the year, at 3lbs. per diem; that a piece of Ground 15 yards square, yielded without irrigation 500lbs. of hay; Suggests allotting Rumnahs near Regimental wells; Advocates the collection of manure in the Cavalry lines, with working parties of Horsekeepers and Grasscutters for manuring the ground, making hay, watering &c.—Says you can get four good cuttings, and that Hurriallee improves the condition of horses, so that the gram may be reduced to two measures a day, from three; Bought Arcot hay at 26 Rupees a ton, gave each horse 10 or 12 lbs a day, and found it no more expensive than grasscutters; Advocates the Quarter Master Serjeant superintending the cultivation of the Rumnahs.—Says that Regimental cultivation would prove to the ryots that it would answer their purpose,

- 1st. To raise large crops at small expense.
- 2nd. To keep their Cattle in good condition.
- 3rd. To improve their young stock.
- 4th. To avert the frequent cases of starvation.
- 5th. To improve the Milk.

Extract of Major Otley's Report.

Says, he had difficulties at first in cultivating Hurriallee: that a Cawnie produces one ton of Hurriallee.

General McLeod Command-  
ing Ceded Districts, Raman-  
droog

March 1856.

Says, there is no land available for cultivation of Rumnah grass within 10 or 12 miles of Bellary ; there is no sufficient supply of water—Objects to the Regimental cultivation and proposes Commissariat Superintendence. Manure cannot be collected, except the lines were covered, flagged and drained ; says that grass is scarce in April, May and June at Bellary. Proposes also to encourage the ryots to cultivate Hurriallee grass in the vicinity of Cavalry Camps ; has seen Hurriallee hay stacked at Bellary in November and December, collected by the ryots 5 or 7 Miles off, and delivered at the rate of one Rupee a bandy load.

Mr. Thornhill  
ASST. RESIDENT HYDRABAD.

Says that if Hurriallee hay were provided, the allowance of gram might be reduced in quantity ; that there is not sufficient suitable land near the Cavalry stations, and not enough water.

Col. Cherry, 1st Lt. Cavalry  
BANGALORE.

Considers that the cultivation of Hurriallee, or Rumnah grass, Regimentally is impracticable ; says, that the cultivation of grass-land would be expensive, as wells must be made and enclosures also. Fluid manure could not be collected without paving the lines. Advocates giving encouragement to the cultivation by private individuals.

Major Strange, 2nd Lt. Cavalry  
JAULNAH.

Considers Hurriallee grass very beneficial, but objects to Regimental cultivation, and considers expense must be incurred at starting, to weed, prepare, enclose and manure the ground ; says that grasscutters are necessary on a march ;—There are no means of cultivation at Jaulnah (of Hurriallee).—Advocates allotting a Rumnah to the Corps at Jaulnah and at other stations, and then stacking the hay at the close of the rains.

Lieut. Colonel Arbuthnot  
3rd Lt. Cavalry, BELLARY.

Says there are no Rumnah grass  
lands within 10 or 12 Miles of  
Bellary.—Is against Regimental  
cultivation,—Advocates, that the Civil Authorities should  
encourage the growth of grass, especially Hurriallee by the  
Villagers; but if Government adopt cultivation, thinks the  
Commissariat should superintend it.—If manure is to be  
collected the stables must be flagged and drained.

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Col. Cumberlege  
4th Lt. Cavalry, SAUGOR.

Says that Hurriallee grass can-  
not be successfully grown at Sau-  
gor; it requires too much labor  
and water, but his horses thrive well on Rumnah grass, which  
is sometimes stacked, sometimes cut and eaten at the time.

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Col. Green 5th Lt. Cavalry,  
KAMPTEE.

Says that the soil of Kamptee  
is unfavorable for Hurriallee grass,  
but good grass can be got and  
stacked from July to February; from February to July grass  
is difficult to be got, and the horses then get 4 seers of Gram  
and 5 or 6 lbs of Kurbee.—Advocates the Rumnah allotment  
system and giving discretion to the Commanding Officer to  
buy what he requires.—Says you cannot lay down rules for  
all stations, as the climate differs.—Advocates the collection  
of hay in the cool months as a supply for the hot ones.

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Colonel Bing  
6th Lt. Cavalry, MHOW.

Considers Regimental agency  
for cultivation impracticable, as all  
classes, such as Quarter Master  
Serjeant, horsekeepers, grass-cutters, are fully employed;  
there is no land near the lines, and water is scarce.—Says at  
Kamptee excellent hay can be got in any quantity at 100  
and odd pounds the Rupee.—It is brought from the country  
and stacked by the Regiment.

Major Blogg 7th Lt. Cavalry,  
BOWENPILLY.

Says that a Ruinnah of 120 Bigahs was obtained from the Commissioner of Saugor, at an Annual rent of 45 Rupees, with a Chokeedar to watch it, was preserved for 8 months (from May to December 1853) and yielded without irrigation or cultivation good hay to the amount of 106,500 lbs.—He also says that the cost of this hay including rent, watching, cutting, carriage, stacking, and thatching was 211 Rupees, or 504½ lbs. per Rupee.—Says that the country round Secunderabad yields Hurriallee and Rumnah grass throughout the year; large quantities of the former can be bought at 38 Rupees per ton, and should be stacked in August.—Thinks Hurriallee could be got at Secunderabad at the rate of 30 Rupees per ton, or about 75 lbs. a Rupee, and Rumnah grass at 14 Rupees a ton, or about 160 lbs a Rupee.—Says that arrangements should be made for securing good dry forage at Sholapore, Jaulnah, Mhow and Saugor.

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Col. Arbuthnot 8th Lt. Cavalry,  
SHOLAPORE.

Says Regimental agency is impracticable, and that the cultivation would be expensive.

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Col. Sheriff, Horse Battery  
BANGALORE.

Is opposed to the Regimental scheme of cultivation.

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Capt. Mein, A. Troop  
JAULNAH.

Is opposed to Regimental agency, and says grass-cutters are wanted on the march in the Field.—Says that grass should be stacked in the proper season.

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Capt. Eaton, C. Troop  
BANGALORE.

Is against Regimental agency.

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Major Brice, F. Troop  
SECUNDERABAD.

Says Hurriallee could be grown at most Stations, 2 Crops a year.—  
Is against Rumnah grass for horses.

Col. Amsinck, Artillery,  
SAUGOR. Grew Hurriallee at Bangalore,  
Secunderabad, and Kamptee with  
success, got a good crop the second season and the ground  
only required weeding and manure, and ploughing every 3rd  
year.—Says that the expense of cultivating hay is about,  
half the wages of grasscutters.—At Saugor it is more difficult  
to grow Hurriallee, but a coarser grass grows which is very  
nutritious, and if weeded and manured is excellent. Hay  
should be cut in September.

Major Hennah, 4th Light Cavalry  
OOTACAMUND. Says that Hurriallee is excel-  
lent and economical, but that  
hay of good quality can be got  
from Rumnahs if attention is paid to it, and if it is cut in  
time.—At Kamptee and Saugor the cultivation of Hurriallee  
fails sometimes.

The Reports, from which the above are extracts, originated  
in a suggestion of Mr. Pritchard Veterinary Surgeon of the  
Body Guard in 1855, that the cultivation of hay should be  
carried out Regimentally.

Although such a proposal appears to have objections, as it  
would limit the growth of hay to the neighbourhood of Can-  
tonments, whereas the best plan would seem to be, to en-  
courage its general cultivation by the Villagers, still the  
evidence then obtained shews plainly that hay could be ob-  
tained (if means were taken) all over the country, and that it  
would be advantageous to the horses.

*The following are Extracts from the Reports of Officers upon  
the advantages of covered sheds for horses.*

Genl. Beresford, Commg.]My-  
sore Division, Bangalore,  
1857. Advocates stables for horses, be-  
cause exposure to alternate heavy  
rains, dust, and a tropical sun, is  
prejudicial to their health. Says that in wet weather in 1856  
the horses being exposed did not lie down for 20 days.—The



horses when exposed suffer from insects and consequent restlessness.—Disease of the loins often occurs, and mange becomes incurable; has known mange cured by putting horses under cover. The horses break their knees at the pickets. From all the above reasons thinks that it would be economy to build stables—Says also that horses under cover would thrive on 8 lbs of gram daily, whilst the allowance to uncovered ones is 10 lbs 11 ozs—Calculates gram at 60 lbs per Rupee—Says he marched 4 Months with 10 horses, and they did not suffer from the temporary exposure, but he gave them extra gram; and he attributes it to their previous good condition.

Considers that if the horses were in covered stables the Europeans could groom their horses; that the exercise would be beneficial to their health, and the employment would relieve their minds from the ennui of indolent barrack life, and they would be more independent of native attendants.

Major Campbell for years the Superintendent of the Government Remount Establishment at Oosoor, agrees in these views.

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<p>Lt. General Sir Patrick Grant K. C. B. Commander in Chief, MADRAS, OCTOBER 1859.</p>	<p>Reports disease in the horses of Desborough's Battery at the Mount.</p>
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Is convinced if the horses had been under cover, the disease would never have appeared, and again urges that at least sheds should be built as cover for horses and men—Says that a large stable of horses under cover close to Desborough's Battery had no disease.

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Commander in Chief in  
INDIA, 1859.

The Commander in Chief in India, in December 1859 reports, that sheds for horses are necessary, as they would protect both men and horses, and that at

present the Stable duties are often neglected, owing to the risk in exposing Europeans.

1858  
Dr. Tumbrell  
SURGEON 12TH LANCERS.

Says, if horses were under cover it would save exposure of the men to the sun and rain, and the health of the men and horses would reap the advantage.

1859  
Dr. Williams  
DY. INSP. GENL. OF HOSPITALS.

Says, if horses were under cover, it would benefit the Soldier as protecting him from exposure.

#### EXPENSES OF STABLES

1860,  
Colonel Bell, Chief Engineer  
MADRAS.

Says, that 3 ranges of stables at 48 stalls each, will cost 25,500 Rupees at Saint Thomas' Mount.

144 horses=25,500 Rupees.

1 horse=177 Rupees=17£.

The above stables would be tiled and drained, and built of brick in chunam.

Mr. Haudin's stables at the Mount cost 75 Rupees per stall, but were built of second hand materials and brick in mud.

#### ESTIMATED COST OF STABLES AT BANGALORE.

The stalls to be 10 feet x 9 from centre to centre and the estimated cost about 180 Rupees per stall.

Dr. Maclean,  
MADRAS, 1860.

Is of opinion that stables would benefit the horses' health; says that grooming a horse in stables would benefit the soldier, as serving to interest, occupy and amuse him; but foresees difficulty in the field, if horsekeepers were done away with.

Lt Mitchell formerly Serjeant  
Major of MADRAS HORSE ARTY.  
1860.

Says, Horse Artillery men do groom their horses, and with benefit to themselves, and to their health, from the occupation.

Says, we have done well without stables, and therefore it is doubtful how far stabled horses would stand exposure in the field—But still stables would be a great comfort to men and horses, especially in wet weather.

Says, followers cannot be reduced--As to grasscutters--Says, green grass is the food of the Asiatic horse, and that hay is an expensive exotic, and its adoption questionable. Says, if you reduce the grasscutters you must increase the pay of the horsekeepers, as the former are the wives of the latter.

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*The following Extracts are taken from the reports and opinions of Officers of the Royal Artillery upon the horses best suited for Artillery purposes, and upon the subject of caring and feeding horses in this Country.*

Lt. Col. C. H. Smith Comg.  
H. Battery R. H. A.  
SECUNDERABAD JAN. 1861.

Considers that Arabs are the best, and Persians next, for Horse Artillery purposes—Country bred horses not good.

The Arabs stand the climate better than Australians, Cape or American horses, and keep their condition under adverse circumstances.—Lieut. Colonel Smith prefers geldings, as they keep their condition and are more manageable—strongly advocates putting horses under shelter, because they cannot thrive in the open air or be kept clean—says, it would be good economy in the end to do so.—

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Capt. Wright, R. A.  
Secunderabad  
JANUARY 1861.

Prefers Persians for the wheel horses, but Arabs for all other purposes--the Arabs do most work and stand the climate best—Is an advocate of shelter for horses.

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Major Godby, R. A.  
SECUNDERABAD JANUARY 1861.

Prefers Arabs to all other horses, as they do most work and keep their condition.—Thinks that Persians are not generally well adapted for Artillery purposes—

They are too light, unsteady in harness and fall off in condition—Prefers geldings—Advocates shelter for the horses, as they would keep their condition, whereas now in the rains they fall off—Barsautti would almost disappear and the horses could be better groomed and taken care of.

Vety. Surgeon Callow R. A.  
SECUNDERABAD JANUARY 1861.

Says that the Arabs are the best horses. They stand the climate, have more endurance, carry more weight, and have better legs than others; they are rather small for draft—Says that Persians and Australians are often sick. Advocates shelter—Says that constant exposure produces disease of the liver, skin, and kidneys, and in the rain diseases of the thorax &c. appear, as also Barsautti. Most of the horses lose condition in the rainy season.

Vety. Surgeon Williamson R. A.  
SECUNDERABAD JAN. 1861.

Prefers Arabs and Persians, to Australians or Cape horses. Says that many of the horses are too small for Artillery purposes—Advocates shelter for horses, because they would not be so liable to mange; they could be better groomed; Says that many horses die of enteritis, brought on by swallowing quantities of sand, from eating their grass off the ground—Says the horses are subject to liver complaint from constant exposure—Says that the grass-cutters cannot get good grass in the the hot season, and the horses should have hay.

I think that the opinions of the Officers which I have quoted above, prove what I stated in my opening remarks, and shew that reform is wanted in the care, management, and feeding of Artillery and Cavalry horses in this Country. Efficiency and economy would both be attained by buying hay and building shelter.

FORT SAINT GEORGE, }  
Madras 30th January }  
1861.

JOHN AYDE, Colonel,  
Commanding Royal Artillery  
Madras Presidency

# Shot-proof Gun-Shields, as adapted to Iron-cased Ships for National Defence.

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A LECTURE

DELIVERED ON THE 29<sup>TH</sup> OF JUNE, 1860, AT THE ROYAL UNITED SERVICE INSTITUTION,

BY

CAPTAIN COOPER PHIPPS COLES, R. N.

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CAPTAIN E. G. FISHBOURNE, R.N. C.B. in the Chair.

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MR. CHAIRMAN,

My object in addressing you is to explain briefly the successive steps by which I have arrived at certain views, having reference to vast changes which arms of great precision, more especially rifled cannon, are calculated to produce in future warfare.

My attention was first drawn to this important subject during our recent war with Russia.

Some whom I see present are acquainted with the history of the "Lady Nancy," a raft carrying a 32-pounder, which was used during the Russian war with great effect at the Sea of Azof. A model of her is before you; but I will not on this occasion enlarge upon her character. A description of her was published last year.

Finding that a single gun on a steady platform could do so much execution, I next turned my attention to the effective protection of the crew, gun, and magazine. This led to the design of another raft (fig. 1, Plate I,) which is provided with an hemispherical iron shield over a 96 cwt. gun. This raft is composed of numerous empty casks. When under fire, water may be admitted into the apartments containing

the latter, so that, the structure being then floated chiefly by the buoyancy of the casks, a diminished area is exposed, and in the event of penetration by red hot shot or shell ignition would be prevented. It will be seen by the drawing and model that a small portion only can be reached by horizontal fire, and this portion is sloped at an angle of 40 degrees, and faced with 4-inch iron. As to vertical fire, I believe there is little to be apprehended, from the uncertainty attending its effect on a moving object. If a 13-inch shell should strike such a raft it would do little damage beyond destroying one or two casks, the loss of whose buoyancy could well be spared, as the gross displacement of casks is almost one-third in excess of that required to float the vessel at a proper fighting height. It appeared that such structures would be very efficient in attacking the Russian forts under circumstances which would not permit the approach of our heavy draught as well as heavy armed ships.

The draft with armament complete, one 68-pounder, is only 3 feet 7 inches before the admission of water, and she may be immersed 5 feet 3 inches without bringing the gun within 4 feet 6 inches of the water.

My proposition was that a number of these rafts should be prepared and taken out in portions to the Baltic for the purpose of attacking Cronstadt, one-third of them being fitted with steam power, so that the whole, without any extraneous aid, might proceed to action under steam, passing along the shallow waters towards which the constructions and arrangements of the forts would not permit their fires to be directed. In the meantime our heavy ships could be engaged in the deeper water; and I think there can be little doubt that the easily converged fire would have had an immense advantage over the small amount of fire which could be brought to bear by the forts upon the rafts in shallow water.

In consequence of the favourable Report\* of a Committee in November 1855, I was ordered home from the Black Sea, and had the honour of explaining to the Lords Commissioners of the Admiralty the nature of the proposed shot-proof raft and shield. At this juncture peace with Russia was proclaimed, and the Government did not therefore consider it necessary to proceed with these matters. Since then, while on half pay, I have occupied myself in preparing numerous drawings and models, which resulted in these now before you.†

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H. M. S. STROMBOLI, Kasatch in the Black Sea,  
13th November, 1855.

Pursuant to an order from Rear Admiral Sir E. Lyons, Kt. G. C. B., Commander in Chief, &c. &c. &c. we, whose names are hereunto subscribed, have repaired on board H. M. S. Stromboli to inspect a gun-raft proposed by Commander C. P. Coles, R. N., and we are of opinion that the invention is one of the greatest practical value.

It appears by the model which Commander Coles produced that the raft combines many advantages, amongst which are—

1st.—Light draught of water.

2nd.—Facility of propulsion.

3rd.—Simplicity and rapidity of construction.

4th.—Great buoyancy; one heavy gun or mortar can be used on each with great precision of fire.

5th.—Protection of the crew.

Looking to the probable nature of future operations against our present enemy, we are further of opinion that this proposal merits the immediate attention of H. M. Government; and, in order that the full benefit may be derived from it, we venture to think it desirable that Commander Coles should be directed to proceed to England and personally to explain his proposal to their Lordships.

We further suggest that under present circumstances secrecy is desirable.

*President.*—Rear-Admiral Sir HOULSTON STEWART, K. C. B.

Captain ARTHUR CUMMING, R. N.

Captain E. A. INGOLFELD, R. N.

Mr. RUMBLE, Chief Engineer of H. M. S. Royal Albert.

Carpenter of H. M. S. Hannibal.

*Present.*—Captain H. HAY, H. M. S. Hannibal,

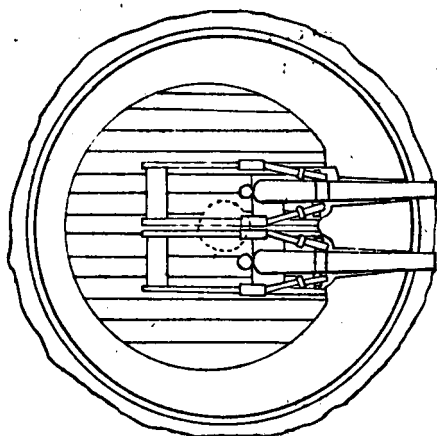
† The models are to be seen at the Royal United Service Institution.

I will first describe fig. 2, Plate 2, which represents part of the side of an ordinary frigate as now built, iron-cased, to 8 feet below the water line, two port-holes being represented, each having an area of 13 square feet entirely exposed to shot, shell, and musketry; immediately in rear of which space are grouped the guns, and the crews which fight them. The serious disadvantage resulting from this condition struck me particularly at Kinburn, when the French floating batteries experienced several casualties effected by shot entering the ports while under a very feeble fire at the distance of 800 yards. It appeared evident that, with the great precision of fire now attained, even iron-cased ships must thus suffer great loss when engaged in close action under a vigorous fire, particularly from grape and canister, and that even one shell of molten iron or liquid fire might on entering a port entirely destroy the vessel, or produce a fatal confusion.

Further consideration strengthened my conviction that the coating of a ship with iron plates, and leaving a perfectly exposed area, amounting in the case of a vessel of 20 broad side guns to 240 square feet, would be abortive.

I beg now to draw your attention to the drawing (fig. 3, Plate 2) in which are represented two guns, placed under either a hemispherical or a cone-formed shield. The port-hole is entirely closed by the gun, save the small space sufficient to permit an elevation of 10 and depression of 7 degrees. The horizontal motion or "training" is effected by turning the shield itself, with the gun, crew, and the platform on which they stand. The whole apparatus thus becomes as it were the gun-carriage, and, being placed on a common turntable, can be revolved to the greatest nicety of adjustment by means of a winch, or of handspikes at the circumference, or of levers in the pivot.





*Fig. 4.*

Fig. 4 is a plan of the shield, showing the two guns and carriages placed parallel, and as close together as the trunnions will allow, but working quite independently of each other. The pivot (see fig. 5, Plate 3, *a a*) is a hollow cylinder 3 feet in diameter, through which the powder is handed up from the magazine, and communication obtained. A current of air is kept up through this hollow pivot by means of a fan, which causes the smoke directly it leaves the breech of the gun to escape through the corresponding opening immediately above it; and should this not be sufficient, a blow-pipe supplied by the fan can be entered into the breech of the gun before the plug is drawn, which on being raised the current of air would force all the smoke in the bore out-board. In a shield constructed according to my invention, the interior *b b* is a wooden dome, composed of massive vertical parts mutually supporting each other, and tied together by means of bolts and a hoop.

The whole exposed upper portion, *c c*, above the glacis is covered with  $4\frac{1}{2}$  inch plates, and the other part is sunk into the deck, and protected by an iron glacis.

Aim may be taken either through a "sight" fixed on the top of the shield, or on the gun, or two may be found advantageous, that on the shield performing the same office as the small "finders" of a large telescope, the shield being as it were the carriage of the gun, and the two always retaining the same relative position.

Although there is a height of 7 feet inside, there are only 3 feet 8 inches exposed above the glacis, consequently there is only a small exposed area. From its globular form no horizontal shot can strike it except very obliquely, when the shot would glance.

No shot has yet penetrated a  $4\frac{1}{2}$ -inch plate at any considerable angle. Fig. 3 Plate 2, represents the apparatus placed amidships in a flush deck vessel; and and fig. 2, two broadside guns of the same calibre out at the perpendicular sides of an ordinary built ship. It is evident that the first shot of a rifled gun might enter the port of the latter, destroy several men, and disable the gun by direct injury to it or the carriage, whereas the shield gun presents nothing but its muzzle. Moreover, the latter trains through the entire circle, the ordinary mounted gun only through an arc of  $45^\circ$  each way.

Fig. 5, Plate 3, shows an entire vertical section of a ship of the same general dimensions and draft of water as the large iron frigates now being built; one side, *d d*, represents the frame as entirely constructed of iron with double  $4\frac{1}{2}$ -inch plates, and the other, *d' d'*, a wooden frame covered with single plates of the same thickness; *e e* would be the main deck of an ordinary frigate; *f f* the lower deck. The main deck is occupied by the turntables for the shields placed amidships of the deck, supported by numerous iron stanchions between decks from top to bottom. The communication with the

lower and weather deck is by means of a 3-foot hatchway to each shield in the shape of a hollow cylinder or pivot, *a a*.

Now, it will be seen that no horizontal fire can strike this structure above the water line, except at an angle of 40 degrees, and that it is completely protected against vertical fire by its arched roof; it is supported on each side at three or more points by stanchions, or fore and aft bulk-heads if necessary.

An enormously strong ship is thus obtained—not weakened, as are ordinary ships, by numerous portholes, but having a continuous side, with the weights placed amidships instead of at the sides.

The experience furnished by the late gales of the effects upon the heavy wooden ships of our fleet, when after a few days' bad weather they were all more or less damaged and unfit for any continuous service, leads me to the conclusion that enormous iron coated ships now building, of great beam, with immense weight of iron on their perpendicular sides, will strain themselves exceedingly, and require constant expensive repair, or soon be rendered altogether unseaworthy. Water getting between the iron plates, parts to which the sun can never penetrate, will always be in a state of moisture. This I believe to be one of the causes of the "Trusty" being rotten.

As a ship of this form with inclined sides, *d d d d*, would have no stability, she would be a bad sea boat, and be washed over by a sea, owing to the absence of sufficient extra displacement.

A second or outer side, *g g g g*, is therefore provided with numerous compartments of iron plates as lightly constructed as consistent with the strength requisite to resist a heavy sea. It is fitted with a falling iron gunwale, *h h*, to allow the gun to be fired over all. A good deck on either side of 18 feet breadth is also thus afforded.

The compartments should be kept perfectly empty, excepting a space sufficient for the stowage of boats as represented. The accommodation below is the same as that of an ordinary frigate. There is ample provision for ventilation in a hatchway of 3 feet diameter, and a corresponding open space at the top of each. There is also room for a hatchway on both sides between the shields. The main deck being secure from water may consist entirely of grating work, or be quite open between the beams, so that the height of two decks is thrown into one for air and light. Durability and prevention from decay is another important feature in these ships. Water cannot get into the inner portion of the structure without first passing through the outer coating. Those who are aware of the destructive effects which are sometimes caused by the penetration of water to the unventilated parts of a wooden fabric, will appreciate this feature.

With reference to steadiness in a seaway, it is clear that from the cased portion inclining inwards, as well as the position of the heavy guns and shields amidships is more favorable than that of the armament placed in the ordinary way through heavy vertical sides; and it is unnecessary to enlarge upon the extreme *desirableness of steadiness of gun platform in a vessel of war*. The very act of working guns on the broad sides causes our present ships to *roll several degrees*; but here, the gun, and appurtenances being in the centre, the movements would be comparatively insignificant. Moreover, when the muzzle of a gun at the side would be under water, that of a gun placed amidships would be perfectly clear of it, and with a given roll of ship the former would pass far more rapidly through a greater distance than the latter in describing a similar arc.

In shields the captains of the gun being able to see the masts of the opponent above the smoke would always keep the object covered, so that the gun would be fired as soon as loaded, without any further training, much would thus be gained in rapidity and precision of fire. The shield

would contain two guns each; and I so place the foremost and aftermost shields, that four guns can be brought right ahead or right astern without transporting from broadside to bow ports, as required by the ordinary port system. Indeed ordinary iron-cased ships cannot have bow or stern ports without incurring the risk of being raked, and of their battery being disabled through the ports. A raking broadside could do little or no harm to a shield-ship such as proposed. She has the power of concentrating her broadside with great precision, the degrees being marked on the circle. From each shield two 100-pounder shot can be thrown simultaneously within 3 feet of each other, by merely connecting the two trigger-lines; and, if boarding were attempted, they could sweep the upper deck with grape and canister, each gun clearing its own portion of the deck; and 8 guns, four-aft and four forward, might rake the deck right fore and aft at the same time. Indeed it may be safely affirmed, that no enemy could for a moment stand upon the deck, whilst the crew of the vessel would be perfectly secure within their iron shield.

In future warfare, when iron ships become general, in conjunction with the power under steam of closing at pleasure, a determined enemy may prefer the issue of a hand-to-hand combat to the fruitless waste of projectiles on an almost invulnerable hull. For such a contingency it is well to be prepared, and judging by the results of bygone days, we have no ground for discouragement should boarding, as in old Roman and Grecian times, be again the ordinary way of meeting an enemy.

I will now point out the comparative destructive powers obtained through the shield and the ordinary port system. The two drawings (figs. 2 and 3 Plate 2) show the comparative lengths of longitudinal space required for 2 broadside guns on the two principles. Two broadside guns on the old plan, with 3 feet 6 inch ports 12 feet apart, occupy 31 feet. Two guns under the shield occupy longitudinally 20 feet; thus one-third in space is gained by the shield, and it will easily be

seen that one-third less length of ship is required to be fortified when mounting the same number of broadside guns. Although these guns are of the same height from the water, this ship has much less area exposed, being much lower and of less length than the one with port-holes. This is a decided gain to the shield ship in weight, expense, and the chances of being hit.

I must beg you to bear in mind, that in all my calculations I compare broadside with broadside, and not the number of guns that a ship carries: for example, we hear of 120 gun ships, but it must be remembered, that they can only bring 60 guns to bear on one broadside. The shield ship brings the whole of her guns to bear on either broadside, and 4 guns right ahead or right astern.

I will take first for example a ship with perpendicular sides coated with iron (see drawing No. 7 Plate 4) according to the present system, with the general dimensions of the "Warrior," who is 380 feet long, and although she has a broadside of 18 guns, only 13 of these are protected by  $4\frac{1}{2}$  inch iron, requiring 213 feet of longitudinal iron-plating. A ship of the same general dimensions on the shield plan would have 20 broadside guns thoroughly protected, as before described by  $4\frac{1}{2}$  inch iron. In my comparisons I will consider those guns alone to be protected, as it is hardly necessary to point out that a three-decker's broadside would soon put *hors de combat* those unprotected, then the destructive power of the shield ship would be to the other as 20 is to 13.

But suppose a shield-ship built with a broadside of 18 guns all protected by  $4\frac{1}{2}$ -inch iron, she would only require a length of 180 feet to be plated with iron, whilst the "Warrior," for the protection of only 13 guns, requires a length of 213 feet. Figs. 7 and 8 Plate 4 show the relative broadside areas of the two ships, from which it will be seen that the shield-ship, requiring so much less space for her guns, may be much shorter, and, therefore, not only less costly, but by far the handier of the two.

With regard to strength and power of resistance it would be difficult to draw a comparison, the side sloping at an angle of 40 degrees having so great a superiority over the perpendicular; but we may form a near enough estimate with reference to the entirely unprotected portion of the respective ships.

This ship (fig. 7 Plate 4) with 18 ports, 3 feet 10 inches by 3 feet 6 inches, has a space of 241 square feet open to horizontal fire, and an enormous upper deck unprotected against vertical fire. The shield-ship has no opening large enough for a 32-pounder shot to enter horizontally, or through which riflemen can do any execution. Against vertical fire they are entirely protected, except the small hole in the centre of each shield, and the chances are very much against this being hit. Should a shell strike this sloping structure, I imagine it would glance off, or, at all events, do less damage than plumping down on a flat deck.

I will now compare its powers of resistance and destruction with those of a wooden 3-decker. Fig 9 Plate 4 shows the half broadside of a shield-ship and of a 3-decker, the hulls being of equal length. The shield-ship has a broadside of 20 guns, 100-pounders, the 3-decker a broadside of 60 guns of various calibres. I will first call attention to the comparative areas to be aimed at, and the chances of being hit. The 3-decker presents an inflammable area, vulnerable to shot, of 10,150 square feet; the shield-ship, 3,750 square feet, both invulnerable to shot and uninflamable.

It must be remembered that after the first 2 or 3 broadsides the ships become enveloped in smoke, little or nothing is seen beyond an occasional glimpse of a mast peering through the smoke, giving the low object then a great advantage over the high one. We know, also, that as the guns get hot the quoins are liable to fly out, or elevating screws run down, throwing the elevation out, and causing the shot to pass over the object. It may be asserted that one gun protected is

equal to ten in the open, and a gun in the open is better than one badly protected by inflammable, splintering materials.

Taking into consideration then all the above advantages, I believe I am within the mark when I state that one gun covered by a shield is equal to ten guns in a three-decker. This would give a ship with 20 guns in shields a destructive power equal to 200 broadside guns in a 3-decker; but, as the latter has only 60 broadside guns, the comparison will be as 200 to 60, or 10 to 3 in favour of the shield-ship. I have then shown that three of these shield-ships would be equal to 10 three-deckers.

Let me next draw your attention to the relative outlay and expense of keeping these vessels in commission. The average cost of the shield-ship with the present iron ships building would be the same; but, taking broadside gun for broadside gun, the shield-ship would be by far the cheapest, for instance, I believe the largest iron frigates building are to cost £320,000, with 18 broadside guns, only 13 of which are protected by iron; but a shield-ship of the same size and cost would have a broadside of 20 guns, all of which are protected by iron.

I will now touch upon the great saving of manual labour, a point of no small consequence in these days, independently of the question of economy.

A gun carrying a 100-pounder shot in the shield can be worked by three men, but say five, viz. one to direct and keep the gun bearing on the object, two to load, and two to attend to the turntable and supply ammunition. The carriage is self-acting, the gun running in and out without being touched.

This carriage has already been tried, and so far succeeded, thus an enormous amount of manual labour is saved: but, as a relief and spare men for other duties would be required, we will allow 10 men to each gun, thus requiring 200 men for the shield-ship of 20 guns, whilst a 3-decker requires 1,000 or 1,200 men. One shield-ship equal to cope with



and destroy three 3-deckers (as before shewn) requires only one-fifth of a 3-decker's complement of men. Then with one 3-decker's ship's company 5 shield-ships are manned equal in power to 15 3-deckers, so that with the same number of men, wages, provisions, and manual labour as 3 3-deckers, 15 ships of the shield plan can be maintained equal to 45 3-deckers, making a saving in favour of the shields as 15 to 1.

The expense, however, may not be the greatest consideration. Our great difficulty in time of war will be to find men; therefore the saving of men here obtained will be a most important point. Why should we in the navy require the same manual labour to work the guns that we did in Nelson's time, when, in every trade and profession, such an enormous amount of labour is saved by mechanical appliances?

Having gone through my various plans of these shield-ships, I will briefly state the mode in which I would organize a force of these ships for our national defence. In these days of electric telegraph and motive power, intelligence of any hostile demonstration on our coast can be conveyed in a few seconds, and, on receiving the intelligence, floating bodies can be moved to any point at a certain speed in a given time. We know that steamers are built to run to New York in a given number of hours; that contracts are daily entered into for vessels to average a certain speed; why cannot we build vessels to traverse the shores of Great Britain at a given average speed? I would then, for our national defences, propose to have five of these shield-ships at Spithead, five at Plymouth, and five at the Nore, assisted by the 150 gun-boats which we already have; direct telegraph communication between these forces, the whole coast, and the Government.

These iron ships being able to move at the rate of 12 miles an hour; I think it would be a bold invader (even if our sea going fleet were called away) who would attempt a landing with these 15-shield ships and a musquito fleet of gun-boats ready to concentrate their powers on him while in the con-

fusion of landing; these 15 ships being able to cope with 45 sail of the present line-of-battle ships. Rafts, as proposed by me in the pamphlet alluded to would also greatly assist in preventing a landing.

My adoption of this shield to land coast defences I will not now dwell upon, but will reserve it for a future period, as I fear that I have already trespassed too long on your patience. I will, however, remark that the same saving of space, manual labour, and expense, is obtained with regard to a fort as to a ship.

Before sitting down, I must, however, without mentioning names, express my gratitude and thanks to those by whose generous aid I have been able thus far to carry out my plans. The experiments which I hope eventually will be made on my shield at Shoeburyness (although much time has already elapsed) will bring my humble efforts to a certain test, and, although I would not speak too confidently, I am not without some grounds for my hope of success.

I have said I would not mention names, but I am inclined to depart from my intention, in order to do honour to the dead. Mr. Brunel, when in 1855 I showed him my shot-proof raft and shield, most liberally informed me that he had himself been planning shot-proof light draught vessels for service against the Russian forts; but acknowledged that I had hit upon the right thing, and that he should think no more of his own plans. He then gave me his valuable assistance, allowed his draughtsmen to draw the plans of my shot proof raft, and with his well known generosity declined to receive from me any remuneration. His remark to me was "Go on, persevere; you only require a breech loader to make your shield perfect."

On Sir William Armstrong's gun coming out I remembered Mr. Brunel's expressions, and, with a fresh impulse exerted all my energies to bring out this invention.

Now that other nations are building iron coated ships, we cannot stop. In future our fleets must fight in armour; and

supremacy afloat must depend henceforth on superior ability to produce the new ships required.

The first outlay for iron coated ships will no doubt be enormous; but, looking to the future, and at the great strides we are making in rifled cannon and in motive power, the reconstruction of the *large* ships of fleets which decide the fate of nations, though a question with regard to the time of full accomplishment, is inevitable. Three deckers and stationary guns on the present system of fortifications for coast defences will become obsolete, and we shall look upon them as we now do upon the old stage coach, which is only used when we can get nothing better. The most economical ship will be that which is the most invulnerable and the most durable.

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## NOTES

ON THE CONSTRUCTION OF IRON-CLAD.

### SHIPS OF WAR.

BY

MAJOR T. HAY CAMPBELL.

*Madras Artillery.*

On reading accounts of Iron-clad ships of War constructed, or proposed to be constructed in Great Britain, it occurred to me that an enormous waste of Material and useless increase to weight must result from the mode in which this principle of defence has been attempted, and a plan having suggested itself to me by which greatly increased power of resistance might be obtained with comparatively diminished weight of Metal, I wrote on the 5th July 1860, to a distinguished practical Engineer in England, offering my crude idea to him, in case he should think it worth working out; his opinion of my proposal is such, that although he anticipates difficulties, I consider the subject well worthy of attention, a copy of my letter is given, as it not only explains the principle I advocate, but shews the position in which I stand towards the gentleman alluded to, should he at any time wish to make use of my offer,

My original idea was to case ships in a coating of horizontal layers of wrought Iron with strong oak beams between each, to run the whole length of the ship, from stem to stern, edge on, all firmly secured together by bolts, the thickness of iron plates to be one inch, and depth from 12 to 18 inches, the thickness of oak beams between each layer of Iron being 3 inches, those dimensions of course being merely suggestive and open to any amount of modification.

This casing to have a plating of 1 or 2 inch wrought Iron, placed flat on the outside, resting on the edges of the layers of iron and wood, and another plating of 1 inch resting on the inner edges of the layers, all to be firmly bolted to the ships side.

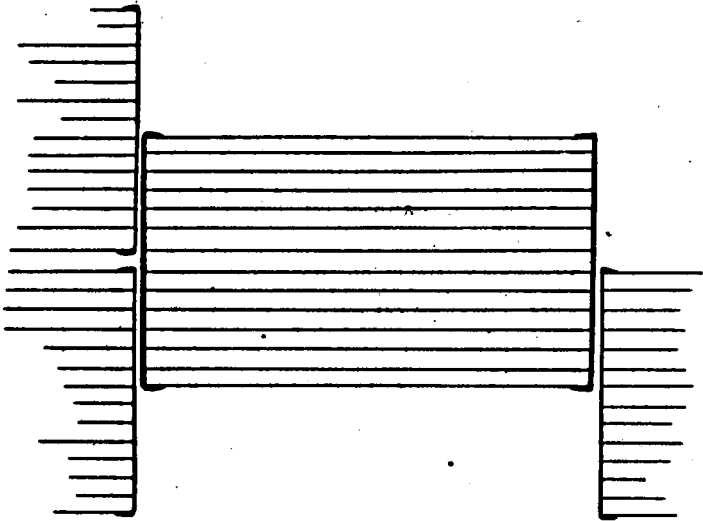
The layers also might be vertical instead of horizontal, though I think the latter preferable, or a combination of the two might be used, the essential object being to necessitate the enemies' shot striking on the *edge* of the iron plate, instead of punching a hole through its *flat side*.

The friend to whom I communicated my idea, having suggested the difficulty of constructing and also of repairing such a structure, though allowing the possibility of both, I am inclined to modify my plan so far as to have the coating subdivided into masses of such dimensions as would greatly facilitate its original application to the ship's side and the repair of any portions that might be injured.

To obtain this, I would form Tubular masses, say of 10 feet by 5, composed of layers of iron and wood of the dimensions already indicated, placed horizontally, secured at each end by vertical plates of the same depth and thickness, the ends of the horizontal plates, being rivetted through the vertical end plates, these masses to be secured firmly to each other and to the ship's sides a thin Iron plating of 1 inch being placed between the ship's sides and the edges of the Tubular masses, and a thicker plating of 1½ or 2 inch iron secured to the outside of all, resting on the edges of the Iron.

*Plan of Tubular Masses on ship's side without the Front or Back Plates.*

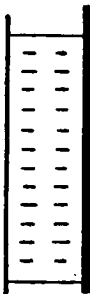
The Black Lines represent the edges of Iron Layers,  
the white spaces the edges of intermediate Layers of wood.



*End view of Tubular Mass,*

with Front and Back Plates, with the ends of Layers of Iron rivetted through the end Plate, which is left white and the rivets made black.

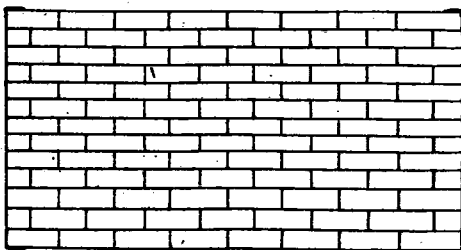
*Section of Tubular Mass with Front and Back Plates.*



Of course the size and particulars of the Tubular Masses must be made to suit the requirements of ships Lines, an enormous proportional increase in strength will not only be obtained over the usual method, by my proposed plan, but the intermediate layers of wood must, by stopping vibration in the Iron plates, greatly lessen the shock and jar upon the ships Timbers when the shield is struck by shot, and the great thickness of the coating will doubtless prevent the ruinous effects upon the ship, caused by shot striking the present mode of Armour, even when they do not penetrate.

A good process for securing the horizontal layers together would be to insert vertical pieces of flat iron between each layer, at convenient distances, say 1 foot, the top and bottom sides of those pieces to be rivetted through the horizontal Plates above and below, forming together a kind of Iron honey comb, into the hollows of which I would insert wood blocks with grain running on towards ship's side, or the Front and Rear Plates might be grooved on the inner sides to receive the edges of the Horizontal Iron Plates, and being strongly bound together, the intermediate Horizontal Plates would of necessity be kept firm in their proper position.

*Front view of Tubular Mass with vertical pieces  
between horizontal Plates.*



The same principle of Iron on edge, might I consider, be applied with astonishing effect, in the construction of Martello Towers and portions of Fortifications were great power of

resistance to shot and endurance are required, also in the building of Magazines, which might thus be made proof against shot and shell of the heaviest kind.

MADRAS,  
24th November, 1860. }

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BANGALORE, 5th July, 1860.

MY DEAR SIR,

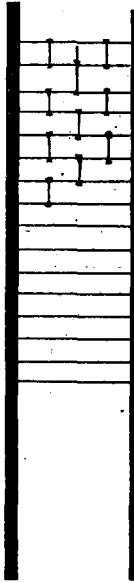
In reading accounts of floating Batteries and Rams it strikes me that the failure in making them Shot proof proceeds from an improper disposal of the Iron Coating, I have seen no description of any plan but that of thick Plates put on *flat* over the outside of the wooden walls.

I have lately applied a well known principle in Girders to the building of Gun Carriages, and with the most marked success, my Carriages having resisted all attempts to break them, though most severely tried, at the same time they are much lighter than those of the old pattern, which constantly break. My experimental Carriages being highly approved of by the Artillery Authorities here, a report upon them is to be sent to Woolwich for consideration, my principle is to use Flat Iron *on edges* with wood layers between, all bolted firmly into a mass, and I think a Floating Battery or Ram, shielded on this plan, might be made to stand the concussion of Whitworth's or any other projectiles under the sun.

What I propose is simply to case the vessel in a shield of wood and iron layers bolted firmly together, say Flat Iron Bars, 12 or 18 inches wide and one inch thick, of convenient lengths, with wood beds of three inch thick between, running *edges* on all round the vessel and being finished off on the outside with iron plates 2 inch thick, bearing flat upon the out edges of the layers, and iron plate, 1 inch thick, between inner edges and ship Timbers.

*Shield in Section*

Outside of Shield where the shot would strike.

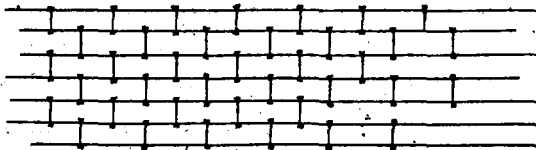


Ships  
Timbers.

Inside of Ship.

N. B.—The Black Lines represent edges of Iron Plates, the white spaces represent the edges of intermediate Wood.

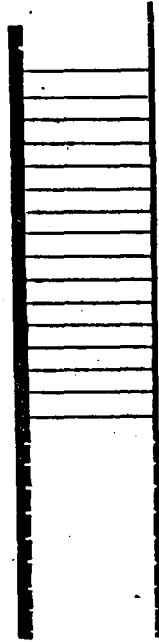
*Horizontal Layers of Wood and Iron running round the ship secured by Bolts.*



The short cross Lines indicate Bolts.



*Section of Shield with Front and Back Plates grooved,  
to receive edges of Horizontal Iron Plates.*



The layers of Wood and Iron might be made vertical, but I think the horizontal better, or the two might be combined, of course I only *indicate* what I propose, the proportions, fastenings and details would have all to be well calculated and considered, and I have no doubt in your hands the Plan could be carried out, so as to bid defiance to every thing, and if it is new, I hope you will put it to the proof, you are most welcome to use it.

Your's truly,

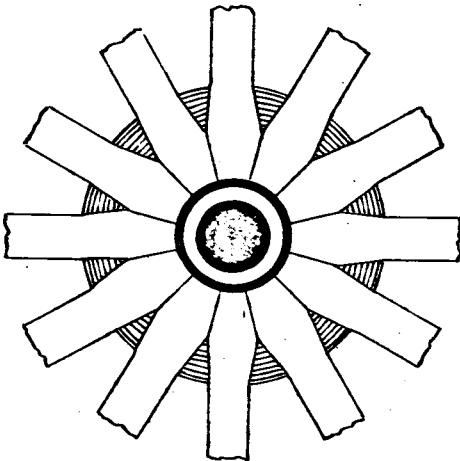
T. HAY CAMPBELL.

## Report upon the Madras Wheel with Gun-Metal Naves for Artillery Carriages.

### GENERAL DESCRIPTION.

The Nave of the Madras Artillery wheel, is composed of two Gun Metal discs or circular plates of equal dimensions, with the Nave box passing through their centres. In the present Madras wheel the Nave box is cast in a piece with one of the plates, but the principle of construction is the same, whether it is so united or cast separately.

Between the two plates are placed the 12 spokes, the latter so formed, that the parts which enter the Nave, are in close contact with each other; and with their ends forming an arch completely round, but not quite touching the Nave box.



The accompanying sketch shows the arrangement of the spokes round the box and also the manner in which they are placed in contact with each other.—When the Nave box, the two discs, and the 12 spokes are thus arranged, the whole construction is then firmly bolted together, with 12 triangular bolts passing through holes

in the discs, and fitting into the triangular spaces, formed between each spoke, by their radiation from each other.

These bolts have circular heads and when driven into their places, their ends are secured outside by nuts.

The simplicity of this construction and its strength, are I think, at once apparent, but in order to appreciate fully its advantages in these and other respects, it is necessary to make a comparison between it and the present Royal Artillery wheel.

A description of the latter is given in a paper by Mr. Bridges Adams read at a meeting of the Society of Arts in January 1857. He says.

“The wheels are still the rude primitive constructions, as regards principle that Thespis might have used in his original Cart. A lump or hub of timber is cut from the butt of a tree. A series of levers are fixed round it, capstan bar fashion, but without the proportioned strength of the capstan bars, each of which is equally strong all over, whereas each spoke is so reduced at the tenon or holding part; where it enters the hub, that it would break short off if unsupported.”

Again he says—

“As the wheel revolves with its load, blows from the irregular surface of the ground, act like tilt hammers, and drive the spokes, partly into the hub and partly into the fellies, but most into the hub, because it is the softest wood rendering the whole loose.—But there is a worse evil than this—No hub is equally hard all around; the weather side of the tree is the toughest, consequently, the spokes drive unequally, the wheel becomes eccentric, and the irregular action is like that of a sledge hammer, rapidly destroying it.”

*As to construction, the Royal Artillery Wooden Nave appears to be subject to the following disadvantages.*

\* In Bengal this circumstance alone has induced the Artillery of that Presidency lately to entertain the idea of metal naves.

1. The difficulty of procuring seasoned choice blocks of woods for naves.\*

2. That the cutting of the mortises and fixing the spokes is a work of art, requiring skilled mechanics.

3. That the Nave box can only be fitted loosely, and that the method of ultimately fixing it by wedges is defective.

*As to strength its disadvantages are ;—*

1.—That the naves and spokes being of wood are apt especially in hot climates to shrink from each other : the spokes thus become drawn out of the naves, the unity of the wheel is destroyed, and the whole becomes weak and ricketty.

2.—That the number of mortises weaken the substance of the naves.

3.—That the spokes are cut away and weak at their entrance into the naves, being the part where most strength is required.

If we regard the Madras Metal Nave in these respects we find ;—

1.—That its construction is so simple that its component parts, viz, discs, nave box, and spokes, can be put together and securely bolted in a few minutes.

2.—That the nave being of metal is not liable to shrink.

3.—That the spokes are thickest at the part which enters the nave, and where strength is most required ; that being of uniform size and forming a complete arch round the Nave Box, they support each other, and as the base of each spoke is wider than the rest of the body, they cannot draw out, being firmly connected by the triangular bolts.

*As to facility of repair.*

With the Royal Artillery wheel, when a new nave is required, the whole must be taken to pieces ; whereas the Madras one being of metal, lasts almost for ever ; but if from injury it requires renewal it can be taken to pieces and any part replaced at once—If a spoke breaks with a Madras wheel, by taking off one plate, another spoke can be inserted immediately.—In 1856 two spokes of this pattern wheel were

purposely broken as an experiment before Sir Patrick Grant the Commander-in-Chief and replaced in 20 minutes.

*As to strength.*

The present pattern wheel has been in use with the Madras Artillery for the last 60 years, and the Officers state that their Naves never give way—It was favorably reported on by the late Duke of Wellington in 1803—Experiments were made in 1857, at Saint Thomas' Mount as to the relative effect of round shot striking metal and wooden naves, and the results tended to show that the injuries in the latter case were more destructive than upon the metal ones.

With respect to the other parts of the Madras wheel, it is to be observed, that the tenons of the spokes, are tightened into the felloes, by means of wedges at the side, whereas in the Royal Artillery pattern, the wedge is inserted in a slit at the end of the spoke, thereby tending to weaken and split it.

The Madras Artillery Officers are also of opinion that the number of Bolts passing through the felloes in the Royal Artillery wheel, required for fastening on the streak tires, are objectionable, as weakening the wheel.

The following is a table of the weights of the component parts the Madras wheel.

No. of each.	Component Parts.	Weights.				Material of which made	Remarks.
		Cwt.	Qrs.	lbs.	ozs.		
1	Top Disc.....	0	0	22	4	Gun Metal.	Too light should be $\frac{1}{2}$ inch.
1	Bottom Disc including nave box.....	0	1	8	0	do.	
12	Triangular Bolts.....	0	0	8	6	Iron.	
12	Hexagonal Nuts.....	0	0	2	0	do.	
12	Spokes.....	0	1	17	8	Teak.	
6	Fellies.....	0	1	17	0	do.	
1	Ring Tyre.....	0	2	24	12	Iron $\frac{1}{2}$ Inch.	
6	Tire Nails (jagged.)..	0	0	0	10	Iron.	
	Total...	2	0	16	8		

After having carefully considered the construction of the Madras Artillery wheel, and having been present in the Carriage Factory whilst the various parts composing one were put together, I am strongly of opinion that it is constructed on a true scientific principle, and that it possesses the following advantages over that of the Royal Artillery pattern.

- 1 Greater simplicity of construction.
- 2 Greater strength.
- 3 Greater durability.
- 4 Greater facility of repair.

In fact after reading the paper of Mr. Bridges Adams, and the Minutes of the Bombay Members of the Artillery Special

\* Both these documents are Committee which sat in this appended.

Country in 1836-37\* in which the evils and defects of wooden naves are abundantly proved, I am only surprised that such a pattern could have been so long tolerated in any Service.

As regards expense, the gun metal naves of the Madras Artillery are doubtless more costly at first, but then it is to be considered, that they are almost everlasting, and at any fate are valuable as old metal when condemned as naves.

The only changes which I should suggest in the present pattern of Madras wheels are, that possibly wrought iron might be substituted for gun metal for the discs and nave box, as being cheaper; that the nave box should be separate from the discs as it could then be replaced when worn out without condemning any other part; and that each spoke should have a felloe of its own, as suggested by Mr. Bridges Adams; also that the Royal Artillery pattern, of a receptacle for grease in the nave box, should be adhered to, instead of its being in the axletree arm as in the Madras pattern.

I append the following papers:—

1. A Description of the construction of the Madras Artillery wheel by Lieutenant Curran, D. A. Commissary of

Ordnance, Carriage Department, with working plans drawn to scale.

2. A Memo: upon the advantages of the Madras wheel by the same Officer.

3. A Report upon the Madras wheel by Major Black, Madras Artillery, Director of the Depôt of Instruction, giving its history, general construction, advantages, and the various experiments that have been made to test its strength; also Appendices, with the Minutes of the Members of the Special Artillery Committee of 1836-38 and the Paper by Mr. Bridges Adams.

Major Black's report is in fact complete in itself, and founded on long experience, his opinion is of far more value and weight than any observations of mine can be.

In conclusion, Lieutenant Colonel Simpson, Madras Artillery, Inspector General of Ordnance, is about to forward to England for the inspection of the Select Committee, two wheels made after the Madras pattern, one with the nave box cast in a piece with one of the discs, and the other with the nave box cast separately—Specimens of some of the best Indian woods for Gun Carriages will accompany these wheels, and their date of departure shall be reported, with details and remarks on the articles sent.

(Signed) JOHN ADYE, Lieut.-Col,  
*Commanding R. A. Madras Presidency.*

8th October 1860.

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#### MADRAS GUN CARRIAGE BRASS NAVE.

1. The Madras Metal Nave is made of Brass, called Gun Metal.

2. It is cast in two parts, which for the sake of distinction, are called the Top and the Bottom.

3. The Bottom is the principal part of the Nave, and is composed of the box and a disk east entire, represented by Fig. 1. Drawing No. 2 (Plate 6.)

4. The Top is the smaller portion of the Nave, and answers the purpose of a Cap to go over the top of the Bottom—its disk is of the same diameter as the disk of the Bottom, and the space between them is to receive the heads of the spokes, Fig. 2 represents the Top. Drawing No. 2 (Plate 6.)

5. There are 12 Triangular holes punched round the disk of the Top, and the same number of cylindrical holes drilled in the disk of the Bottom, the circles round which these holes are made are equal.

6. To each Nave there are 12 triangular bolts with cylindrical shanks and the same number of hexagonal Nuts. Figs. 3 and 4 represent the bolt and nut. Drawing No. 2 (Plate 6.)

7. When the wheel is about to be made, the Bottom is placed in the centre of a table or platform: round this platform (at a diameter equal to that of the wheel to be constructed) are fixed 12 stancheons, or heads, at equal distances; these are secured to the bench or platform by being keyed and wedged underneath.

8. The Spokes are arranged in the following manner:—First, two spokes one opposite the other, are fitted against the Nave box as shewn in the Drawing No. 1. (Plate 5) After the joints are properly made, the spokes are drawn tight against the Nave box by means of wedges inserted and driven hard between the ends of the spokes and the stancheons.

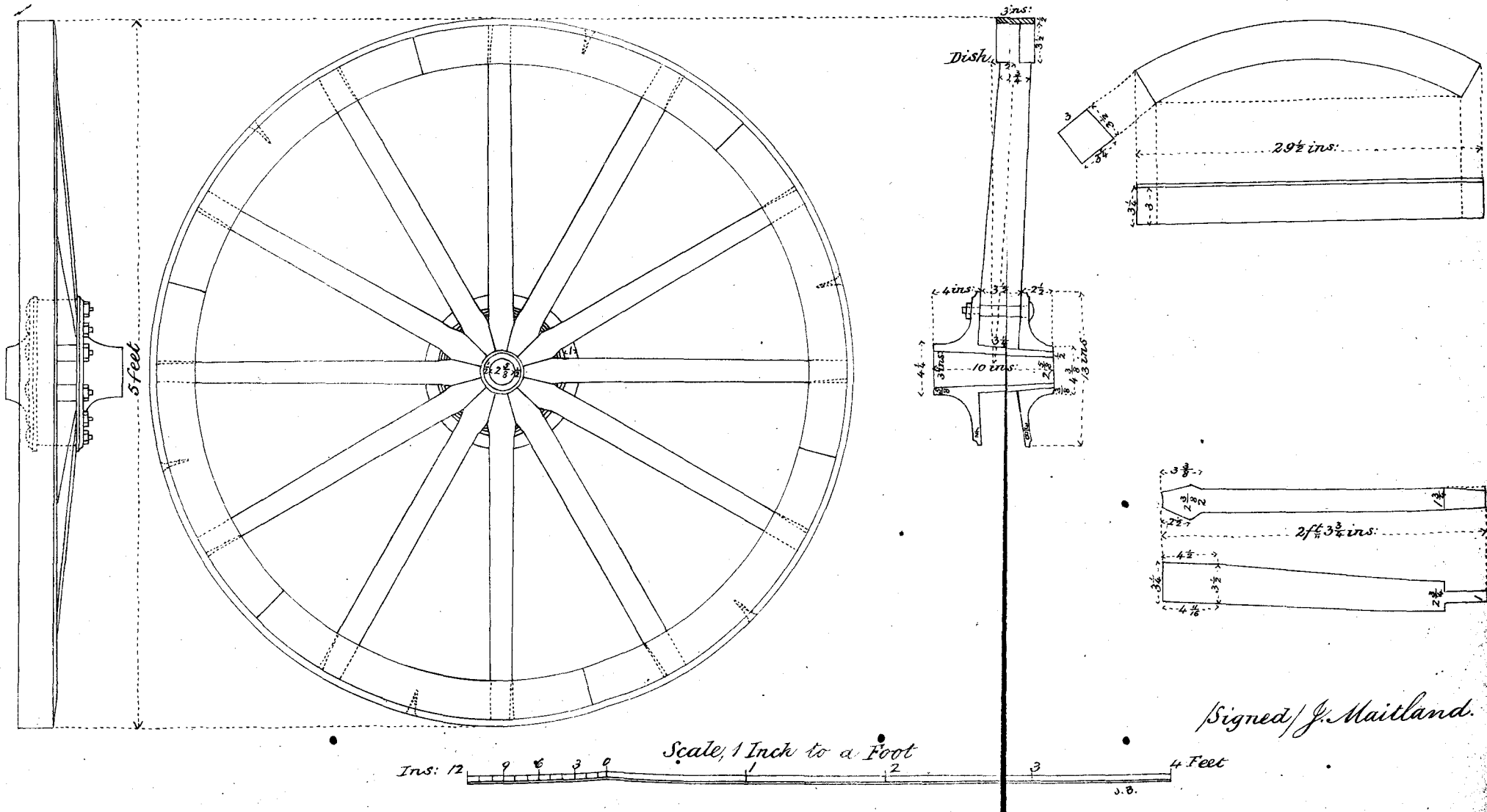
9. Two other spokes are now fitted in like manner, but at right angles to the former, and tightened by the wedges as before. The next two pair of spokes are fitted at right angles to each other, but which will not be so to the former two pair, and the last two pair are then finally fitted on.

10. When all the spokes are fitted on and tightened by wedges all round, and are firm and close together, the top is



Wheel for Light Field Carriage  
Established Pattern.

Plan shewing the method of fixing the spokes in the Brass Nave.



Signed / J. Maitland.

No. 2.

Brass Nave for Light Field Carriage,  
Established Pattern.

Fig. 1.

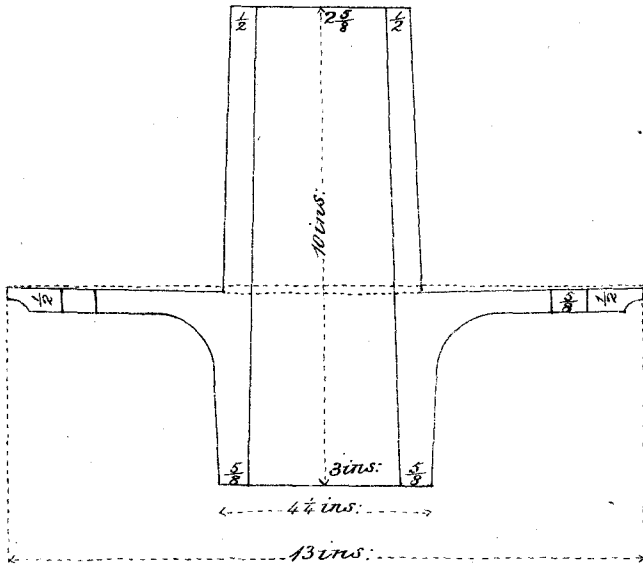


Fig. 2.

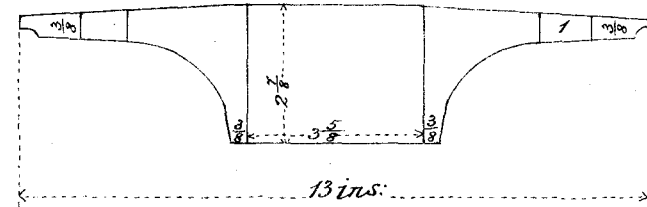


Fig. 3.

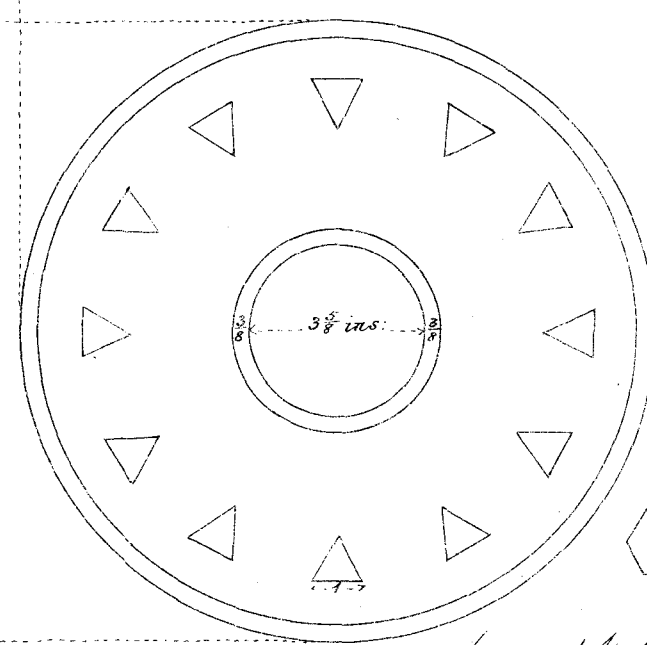
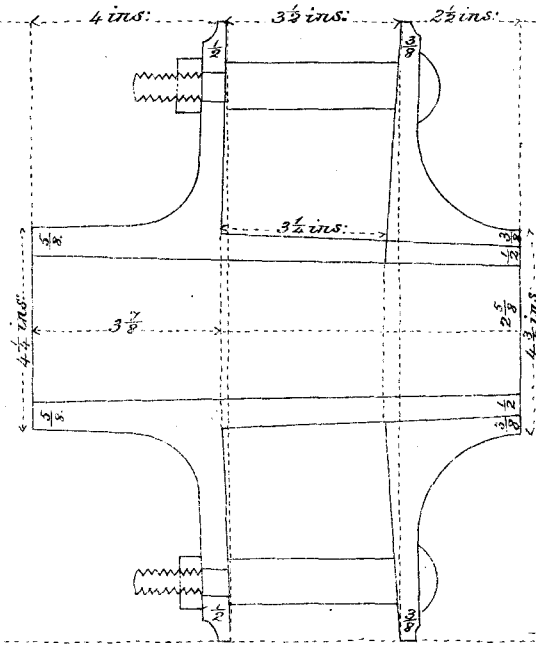
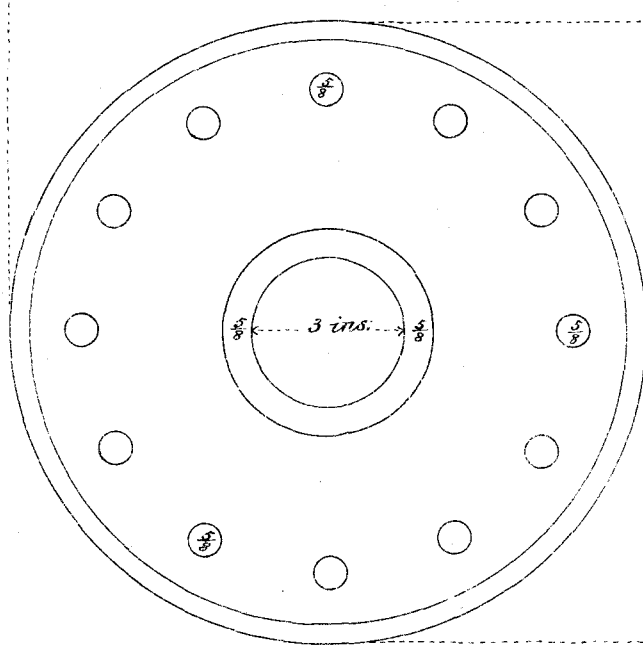
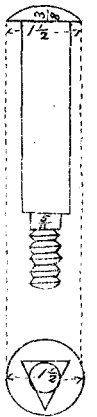
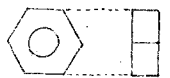


Fig. 4.



Drawn 1/4 Size.

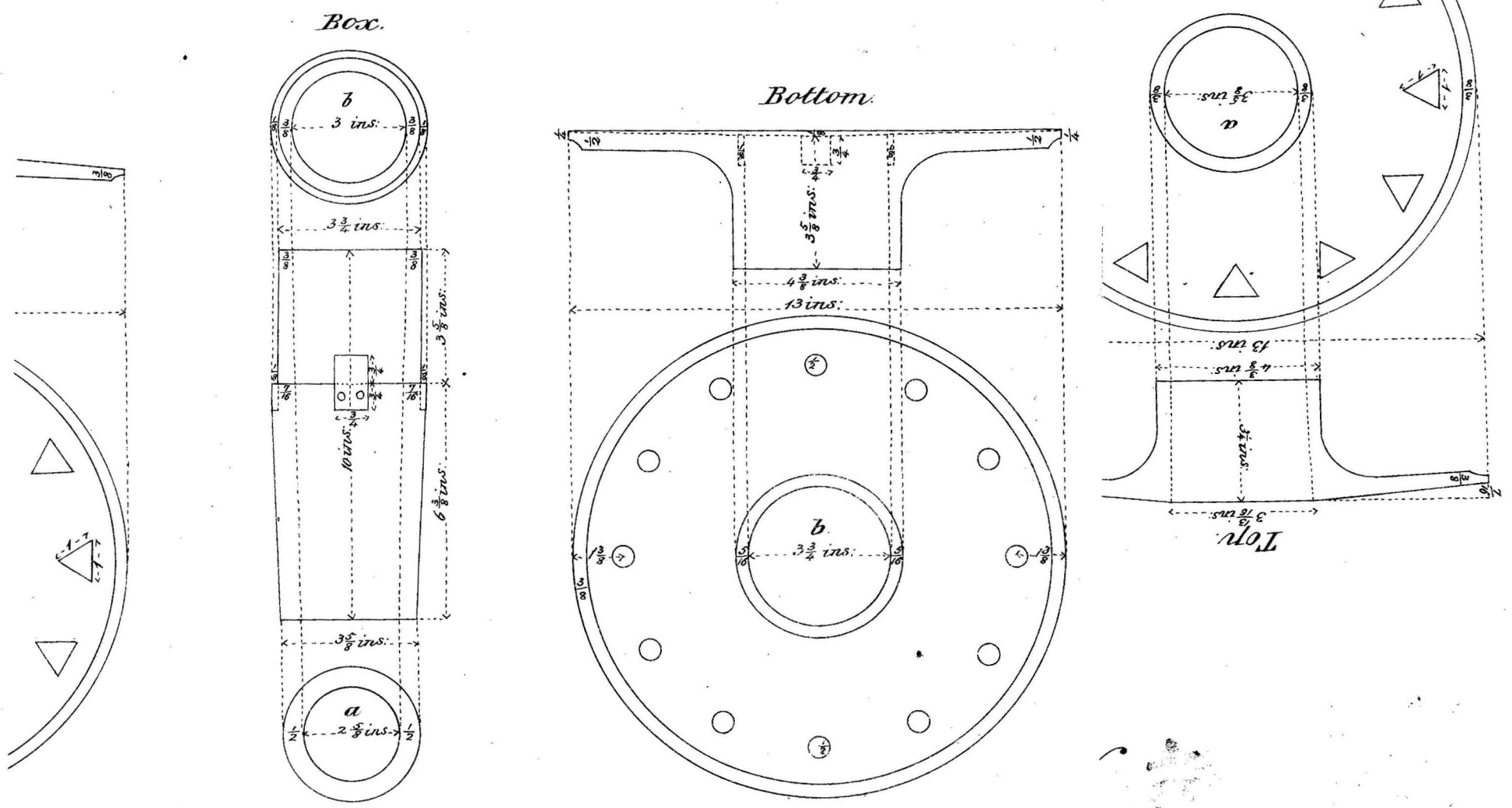
Signed / J. Maitland.

Miscellaneous.

Plate 7.

N<sup>o</sup> 3.

New Pattern Brass Nave,  
in three pieces.



Note... When the Top and Bottom of the Nave are of Cast Iron,  
the thickness of the plates will be increased 1/8 inch.

Drawn 1/4 Sixe.  
PRINTED BY N. SPENCER.

Signed J. Maitland.

J. BINNY DEL.

put on, and the Triangular Bolts, with one of the angles converging to the centre of the nave, are driven from the Top through the opening in the spokes and through the round holes in the Bottom of the nave. When this has been done the wedges between the ends of the spokes, and the stanchions are released, and the wheel without the felloes removed from the table, when the bolts are screwed up with their nuts.

11. The felloes are next put on in the same manner as they are in any other wheel with a wooden nave. The wheel is then ring tired, and lastly, dressed up and put on to the Carriage.

12. The drawing marked No. 3 (Plate 7.) shews the Brass Nave in three parts, viz : the Top, Bottom, and the Box. With the Nave suggested by Mr. Curran, Madras Gun Carriage Manufactory, the wheel is constructed in the same manner as the wheel with the Brass Nave in two parts. The great advantage in this nave is, that the Top and Bottom are almost rendered perpetual, because, in the Brass Nave in two parts, if the box wears and thereby becomes unserviceable—the box with bottom altogether nearly  $\frac{2}{3}$  of the Nave is rendered useless, and must be renewed; but, with the Nave in three parts the box alone is renewed if it wear away.

13. The dish of the Brass Nave wheel is 2 Inches, and this dish is regulated in the inclination given to the disks of the Top and Bottom of the Brass Nave, and is shewn in Drawings Nos. 1 and 2 (Plates 5 and 6.)

14. The dish is measured between a perpendicular line drawn from the centre of the nave box and the space between the disks, and another line drawn from the same point through the centre of the spoke up to the shoulder of the tenon of the spoke—the difference between these lines is the dish—and is equal to 2 Inches.

GUN CARRIAGE MANUFACTORY,  
Madras, 17th September 1860. }

(Signed) J. CURRAN,  
Deputy Assistant Commissary.

**WEIGHT OF A MADRAS ARTILLERY WHEEL.**

No. of each.	Component parts.	Weight.				Material of which made.	Remarks.
		cwt.	qrs.	lbs.	ozs.		
1	Top ... ..	0	0	22	4	Gun Metal.	
1	Bottom including nave box ... ..	0	1	8	0	do.	
12	Triangular Bolts ... ..	0	0	8	6	Iron.	
12	Hexagonal Nuts... ..	0	0	2	0	do.	
12	Spokes ... ..	0	1	17	8	If Teak.	
12	do. ... ..	0	2	4	0	If Peddowk.	
6	Felloes ... ..	0	1	17	0	Teak.	
1	Tire ... ..	0	2	24	12	{ Iron $\frac{1}{2}$ inch } This tire is too light: it should be increased in thick- thick. } ness to $\frac{3}{8}$ inch.	
6	Tire nails (jagged) ... ..	0	0	0	10	Iron.	

	Cwt.	Qrs.	lbs.	
Total.....	2	0	16 $\frac{1}{2}$	if made of Teak spokes.
do. ....	2	1	3	if made of Peddowk spokes. In these Wheels the spokes and felloes have not been fully dressed, when fully dressed the teak spoke Wheel weighs 2 $\frac{1}{2}$ lbs. and the Peddowk spoked wheel 7 lbs. less.

GUN CARRIAGE MANUFACTORY, }  
Madras 20th September 1860. }

THE ADVANTAGES OF THE MADRAS GUN CARRIAGE BRASS  
NAVE WHEEL OVER WOODEN NAVE WHEELS.

1. The chief advantage in this wheel (in India where ring tires are used in all wheels) is the great facility of repairing it when disabled in the field. For instance, if a spoke breaks it can be taken out without cutting the tire, which is done by unscrewing the bolts that keep the top and bottom together, and removing the top, and the spoke is then replaced by a new one.—If a felloe give way it can also be renewed without cutting off the tire; and this is done also by unscrewing the bolts of the top and bottom and taking off the top, then the felloe and its two spokes are removed—the broken felloe is then taken out, and a new felloe fitted to the spokes when the whole three can be jammed down together between the nave box and the tire; and in place of the wooden dowels which connect one felloe with another, the junction of the new felloe with the old ones can be secured by thin plates of Iron (about  $\frac{1}{4}$  inch thick) screwed on.

2. The Brass nave is never rendered unserviceable from causes which attend wooden naves—such as dry rot; shrinkage from insufficient seasoning; splitting and cracking &c.

3. The portion of the spokes inserted between the Top and Bottom never decays or becomes unserviceable or shaky as is very often the case with the spokes in a wooden nave—and this portion of the Brass Nave wheel is always in the soundest and most efficient state.

4. The Ring tire of this wheel is far preferable to the strakes in the Royal Artillery English wheel—In this country where the fluctuations of heat and cold are so great, and the roads generally are in a very bad condition, and in some parts no roads at all, strake tires for wheels will never

answer.—Experience has long established this fact, and that is the reason why ring tires have been adopted. Also the country woods will not bear so many perforations in the felloes, as are made in the straked wheels to keep the strake attached to the felloes.—This was tried and proved by the Royal Artillery at Secunderabad.

5. The mode of wedging the tenons of the spokes into the mortises of the felloes in the English wheels as well as the Pungal wheels is objectionable—In these wheels the wedge is driven in the centre of the end of the tenon and this divides the tenon into two equal parts, thereby reducing the strength of the tenon as well as giving it a great tendency to split the spoke in halves, or from being weakened, breaking off at the shoulder—This has often been the case—In the Brass Nave wheel it is not so ; the tenon is made fast and tight in the mortise by driving the wedge on one side of it, thereby retaining the whole strength, as no part is cut away, nor has it any tendency to break off, or split the spoke.

6. There is an objection to the mode of fitting the nave box in the wooden naves of the Royal Artillery wheels—The Boxes being cast iron will not permit tight driving into the nave. Consequently, the nave box is let in quite free and easy and then tightened by driving wedges into the wood at a little distance from the box all round.—These wedges will, in the course of time, fall out and become one means of rendering the nave unserviceable.

7. The recess in the nave box for grease in the Royal Artillery wheels is preferable to the way of doing this for the Indian wheels—the recess for which is made in the axle tree.

GUN CARRIAGE MANUFACTORY,  
Madras 17th September 1860. }

(Signed) J. CURRAN,  
Deputy Assistant Commissary.

ARTILLERY DEPÔT,  
 SAINT THOMAS' MOUNT,  
 22nd September 1860.

No. 376.

*From,*

Major B. W. BLACK,  
*Director Artillery Depot*

*To,*

Lieutenant-Colonel J. M. ADYE, C. B.  
*Commanding Royal Artillery,  
 Madras Presidency.*

SIR.

Referring to your wish for information regarding the Wheels with metal naves in use with all the carriages of the Horse Artillery and Light Field Batteries of the Madras Artillery, I have the honor to inform you, that nothing appears on record in this Department regarding the introduction of this pattern of wheel into the Service: but it is generally understood that wheels of this description were in use with the Artillery of Tippoo before the fall of Seringapatam, and therefore its origin may be attributed to the ingenuity of some of the French Officers who were in the service of Hyder and Tippoo in the last Century.

2. The earliest recorded mention of wheels of this pattern is by the Duke of Wellington, who when referring to



the state of the Carriages with the force under his command in 1803, in a letter to Lieut. General Stuart, spoke of the superior efficiency of wheels of this pattern under the designation of "Captain Scott's form," that Officer being at the time Superintendent of the Manufactory of Gun Carriages in the Madras Presidency. The following is extracted from the letter in question dated 24th April 1803.

"There is not a serviceable wheel in the whole detachment excepting those in Captain Scott's form, 6 Pdr. Carriages and tumbrils,"

\* DETAIL.

Diameter..... 5 Feet.  
 Nave..... Metal discs.  
 Tyre..... Ring.  
 Dish..... 2 Inches.  
 Axle Arm..... slightly conical, set on straight.

3. The peculiarity of pattern, detail as per Margin,\* thus commended, for its superior efficiency consists in the nave being constructed of two metal plates

or discs, between which the spokes are in close contact with each other, surrounding, though not in contact with, the nave box; thus forming a complete circular arch, of which the ends of the spokes are the voussoirs, the naves and spokes being firmly retained in position by triangular bolts, which exactly fill the angles formed by the latter radiating towards the felloes; the whole wheel being afterwards brought into a compact structure by compression towards the centre, caused by shrinking on a ring tyre.

4. This wheel in use now uninterruptedly for 60 years, has never failed in the experience of any Officer of the Madras Artillery; but on the contrary it has always presented the very important advantages over those constructed with wooden naves in the greater facility the construction of it affords of replacing damaged spokes and felloes; of less friction in draught from the shortness of axle arms, and the less liability to disruption when struck by shot.

5. This pattern was adopted by the Special Board of Artillery Officers from the three Presidencies, convened in Calcutta in 1836, for the wheels of the Carriages of all Light Field Batteries.—The Bengal Members however expressed their doubts of the propriety of introducing metal naves generally into the service of that Presidency, and also urged economy as a reason for their preference of wood. Nevertheless I venture to think, even if the superiority of metal naves of this pattern be not so strikingly apparent, that this objection is based on a fallacy—for the cost of a wooden nave is an absolute expenditure, to be incurred again and again, as the material becomes unserviceable from climate as well as from wear and tear. Whereas, a metal nave, although more expensive at the outset, is subject to no such deterioration, and moreover whenever rendered unserviceable by injury, it retains its intrinsic value as material (whether the plates be of wrought iron or of gun metal) which is not the case with a wooden nave. But mere economy will scarcely be maintained as a sufficient reason for retaining wood for naves, if the superiority claimed for the metal nave of the Madras pattern, which the experience of 60 years seems to justify, be conceded by the authorities who have to decide on the pattern wheel for Batteries serving in all India. It is however now understood that the Ordnance Authorities of Bengal are considering the expediency of introducing metal naves of this Pattern, in consequence of increasing difficulty in procuring wood suitable for naves in sufficient quantities for the Artillery of that Presidency. As the arguments on both sides should be considered together, extracts from the

Appendix A.

Proceedings of the Special Board are appended hereto.

6. So remarkably efficient has this metal nave proved during the long period of its use, that the only improvement

\* Now a Deputy Assistant Commissary of Ordnance, and a Lieutenant.

suggested since its introduction is that by Conductor Curran\* of the Gun

Carriage Manufactory, whose recommendation that the Nave Box be cast separately from the inner disc, was favorably reported on by the Select Committee. His letter and reason for the suggestion are appended.

Appendix B.

by the Select Committee. His letter and

7. His Excellency Sir Patrick Grant, K. C. B. shortly after assuming command, saw when visiting the Gun Carriage Yard, two spokes of a Madras wheel broken with a sledge hammer, and the wheel made fit again for service in 20 minutes; fresh spokes having been worked up from the rough and fitted in his presence. This repair it is true was executed by practised Artificers; but when I was with a detachment of Horse Artillery on Field Service in 1844 in the Kolapore state, the districts of which being over the range of the Western Ghauts, are of more than ordinary difficulty for Artillery, I saw a wheel of one of our Carriages, after it was injured to an extent greater than two spokes, complete the day's march as efficiently as the sound wheels. The wheel was after the close of the march of course repaired without loss of time, not so expeditiously perhaps as the wheel in the Gun Carriage Yard in the presence of the Commander-in-Chief, for the work was executed by native Artisans, who had never before put their hands to a wheel of the kind; but the repairs were so efficiently performed that the wheel in question continued in use till the close of the Service.

8. His Excellency being also desirous of testing the comparative merits of wheels constructed with metal naves and wooden naves when subjected to the fire of round shot, an experiment with this object took place at Saint Thomas' Mount in 1857, resulting in the opinion of His Excellency, greatly in favor of wheels with metal naves.—A copy of the report of this experiment is appended.

Appendix C.

greatly in favor of wheels with metal naves.—A copy

In January 1857, a Paper by Mr Bridges Adams on the construction of wheels, and the form of axle arms, was read at the Society of Arts.—As the views advocated by this

The model of a disc mitred centre wheel in the Woolwich Arsenal, referred to by Mr. Adams in this paper, I believe was sent from the Model Room of the Madras Artillery in 1854.

Gentleman coincide very remarkably with the plan on which the Madras wheel is constructed, his Paper (appended hereto) will be perused on the present occasion with much interest.

Appendix D.

ARTILLERY DEPOT,  
ST. THOS. MOUNT, }  
22nd Sept. 1860 }

I have the honor &c.  
(Signed) B. W. BLACK, Major  
Director Artillery Depot.

P. S.—Since the foregoing was written Lieutenant Colonel Simpson, Inspector General of Ordnance and Magazines, has informed me that there are on record in that Office some interesting Papers dated as far back as 1801, relating to the origin of this pattern of wheel, and of its introduction into the Service.

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## APPENDIX A.

Extract from the Proceedings of the Special Board of Artillery Officers assembled at Calcutta, July 1836,

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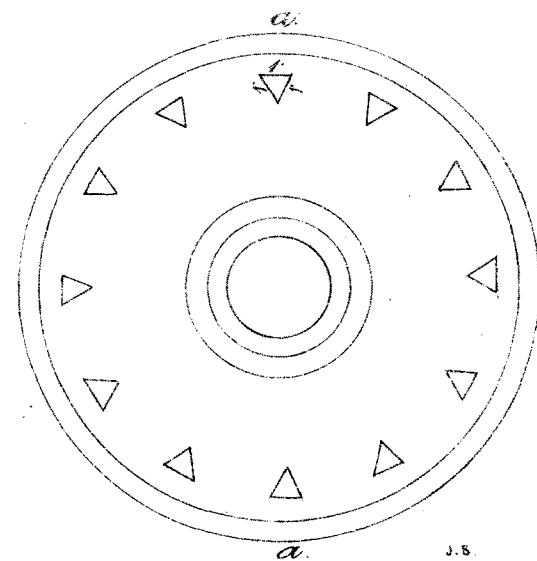
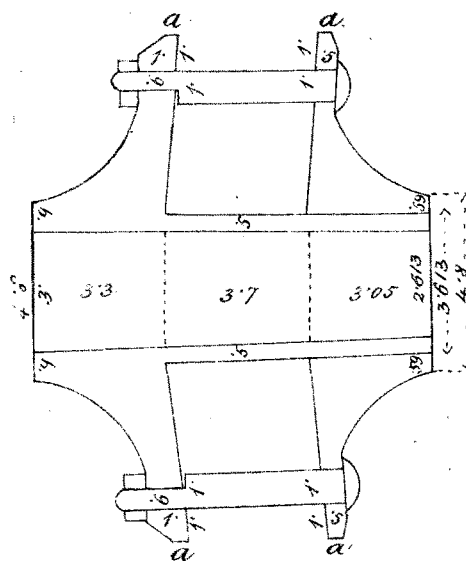
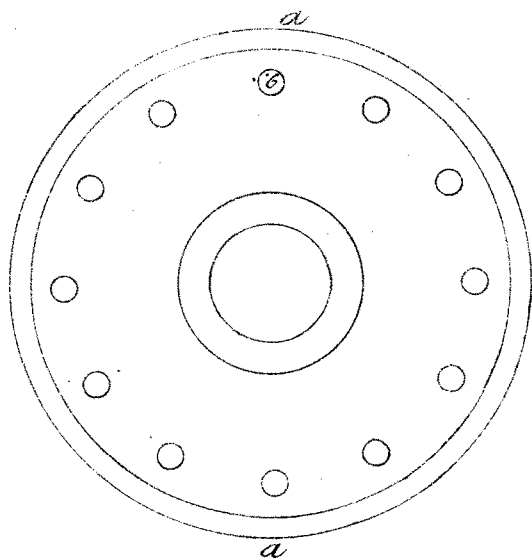
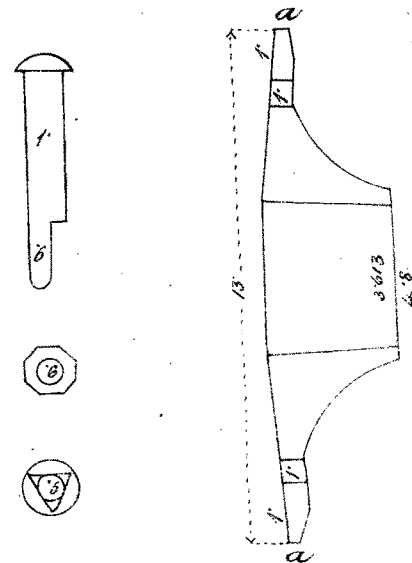
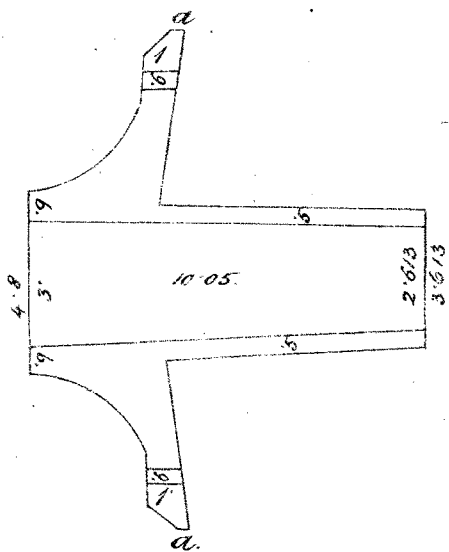
### AXLETREES.

The Board after observing the action of the wheels in the axletrees formerly proposed by them, have unanimously determined, to make the axletree arms 2.5 inches diameter at the lynch end, instead of 1.5 as formerly proposed; retaining however, the diameter of 3 inches at the shoulder; thus making them less conical. They have also determined, that the centre lines of the arms, shall lie in a straight line from end to end of the axletree; and not the lower surface as formerly proposed.—The principal object of these changes, has been to obtain accuracy in finishing (which they found difficult to procure under their former determination) and yet to retain all the practical advantages which were of any great moment (See plan of axletree, Plate 8.)

### NAVES.

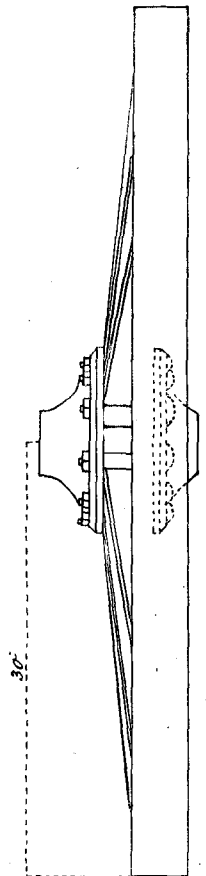
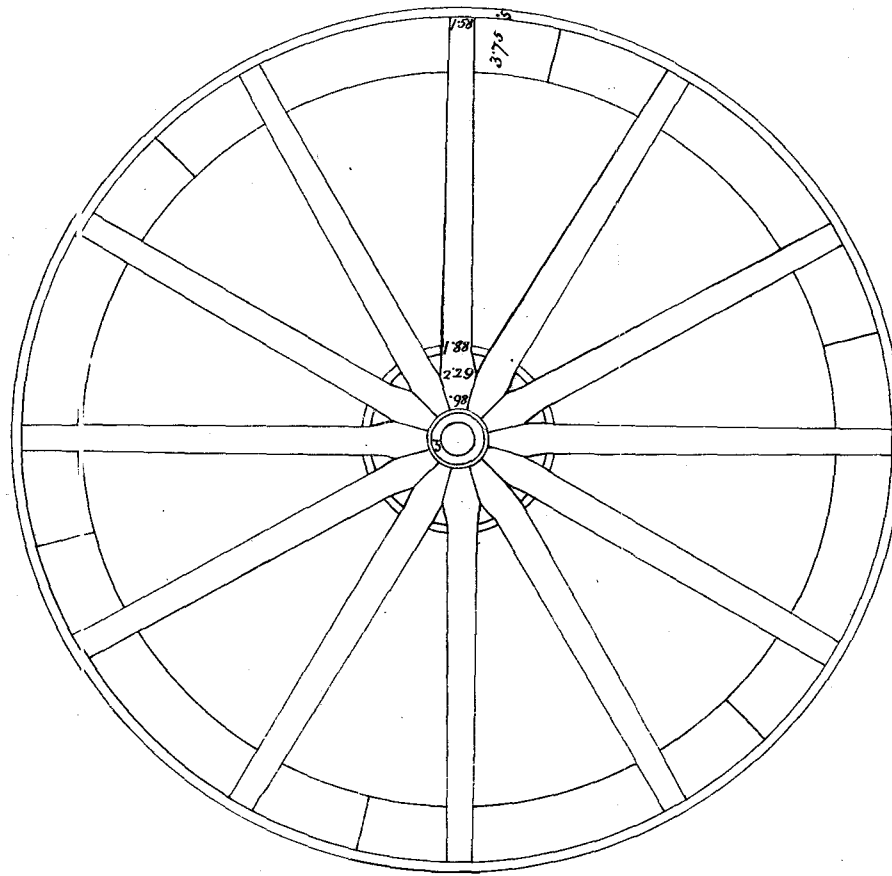
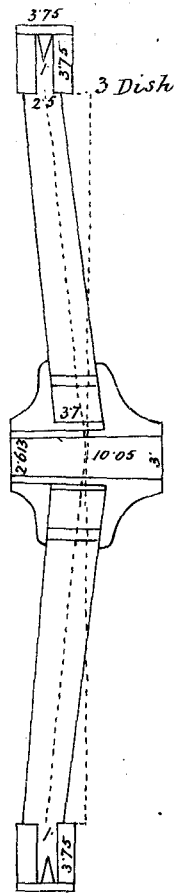
The alteration in the shape of the axletree arm, has made a corresponding alteration necessary in the nave box, which is consequently widened towards the lynch end.—The Board conceiving too, that it was of importance to have the nave box of the greatest possible length, consistent with the already determined length of the axletree arm, have agreed to discontinue the small brass washer in use at Madras, and to add its thickness to the length of the nave box, which will now be 10.05 inches.—With a view also to facility in making the naves, at the same time that they sacrifice no useful object, they have determined to discontinue the collar at the shoulder of the axletree.—A plan of the nave as modified above, is added for the information of Government (Plate 9.)

Nave  
for  
Light Field Artillery Carriages.



Miscellaneous.

Wheel,  
for  
Light Field Artillery Carriages.



## WHEELS.

The board fix the following dimensions for the wood work of the wheels when finished.

Felloes.	{	Length.....inches	30. 0
		Breadth.....	3. 75
		Depth.....	3. 75
Spokes.	{	Length.....	26. 93
		Thickness.....	Nave Felloe 1.88 ..... 1.58
		Breadth.....	{ at base 3. 7 at felloes 2. 5

The dish of the wheel the Board fixes at 3 inches, measured between a perpendicular let fall from the centre of the nave box to the ground, and a radius of the wheel drawn from the same point; which is equal to  $2\frac{1}{2}$  inches measured from a perpendicular let fall from the circumference of the nave plate close to a spoke, and a radius to the wheel drawn from the same point (Plate 10.)

The Board make the following observations as necessary to be attended to, in putting a wheel together.

The spokes should be so formed, at the end which enters the nave, that they may closely fit to each other; and that when pressed to the centre they may form a compact body, on the same principle as an arch. Hence when the tire of the wheel is put on hot, it affords the necessary pressure by contracting as it cools, to ensure this compactness of the wheels. The ends of the spokes next to the nave box must not therefore, touch the box, but a free space of about  $\frac{1}{2}$  of an inch must be left between them. The triangular bolts should also press against the spokes when they are fitted home, to prevent them drawing outwards from the nave in case of occasional shrinking, which would tend very much to weaken the wheel. But there should be no shoulder to the spoke outside of the bolt, which by resting on it would pre-



vent the action of setting up the wheel and be extremely liable to cause the spoke to split under that operation, or if at all loosened in travelling; care should also be taken that the spokes are of sufficient width to fill the space between the plates, when fully screwed up; and should indeed, be left rather in excess, and their fitting nicely adjusted by rasping them; when the spokes of a wheel become loose from shrinking, the Board think, that under most ordinary circumstances the remedy may be applied without the tedious operation of setting the wheel up, which requires to remove the tire, and to contract it. If spaces are formed between the spokes by shrinking, the plate bolts as far as necessary may be removed, and thin wedges of wood may be introduced to fill up the spaces. These wedges being cut off to a proper length, will be secured by restoring the bolts which pass over them. If the space is left between the plates and the spokes, the outer plate must be removed, but without disarranging the spokes themselves; and as they are broader at the end towards the nave box, than at the edge of the plates, if the excess of width is removed from one side and wedges applied to the surface of them, with the thicker end downwards, and of sufficient thickness to fill up the space between the spokes and the plates, they will be secured by the pressure of the plates when again screwed together, and thus make the wheel tight. The Board recommend (in order to break the jarring noise to which these wheels are liable, by the wood playing upon the metal) that a piece of leather may be inserted between the spokes and the plates, before they are screwed up; with these precautions, the noise will be as much obviated as possibly can be expected in this climate; and greater compactness will be given to the nave; in cases of excessive shrinking, however, the wheels must still be set up anew, in the usual manner, by removing the tire; but when this is done any wedges which may have been introduced between the spokes should be previously removed or thinned as much as practicable.

The two interior edges of the felloes, with the spokes, are to be rounded off, and their upper breadth to be somewhat contracted between the spokes, to throw off mud and sand in heavy roads. The lower surface of the felloes, and of the tire, is to be made parallel to the centre line of the axletree arm, so that the exterior circumference of the wheel shall be part of a cylinder. Although the Board do not think it necessary, that the wheels of the 6-pounder and 12-pounder howitzer, should be equally heavy with those of the 9-pounder and 24-pounder howitzer, yet as the difference would be trifling, and as the advantage of having all wheels of the same size for field carriages of every description is manifest, they have adopted the heaviest wheel which is necessary for the two latter pieces as their standard in this respect.

#### MINUTE BY THE BENGAL MEMBERS.

The Bengal Members cannot allow the proceedings of the Board to draw to a conclusion, without entering on record that, from the experience they now have in constructing wheels with brass naves, and the knowledge thereby acquired, in the principles of their construction, they have been led to entertain great doubts of the propriety of generally introducing them into the service of that presidency, and they deem it necessary to record, for the information of the Supreme Government, their reasons for entertaining these doubts.

The Bengal Members must conclude from the best information they possess on the subject; that the variation of climate from dry to moist in the different parts of the Bengal Presidency, and even the variation of climate in the same part at different seasons, are much more extended in their influence, than within the presidencies, of Madras and Bombay; at least their own experience brings to their recollection, effects of climate in different parts of Bengal, much more severe on their carriages, than appears even to be experienced at either of the other presidencies; and it is on record in the proceed-

ings of the Bengal Select Committee, by their late Gun Carriage Agent, Major Fulton, that the influence of the dry winds and hot weather in the upper provinces is so great, as not to be reconciled with anything of the same kind recorded in the other presidencies. The Bengal Members therefore, conceive that they may fairly reckon meeting with objections to the wheels now proposed, that have never been discovered or contemplated in the experiences of Madras and Bombay, and which cannot be elicited by any experiments they can institute at present.

These objections they conceive, are likely to arise from the nature of the materials with which the new wheels are constructed, in which the naves being of metal, and proof in a great degree against the effects of variations in the climate, while the spokes and felloes are of wood, and fully susceptible of such effects in the highest degree, must by this difference, produce much more serious consequences, than when the whole being of wood partakes throughout of the expansions and contractions produced thereby; and yet it is an ascertained fact that wheels made in the rains in the upper provinces (or made in Bengal proper, at any seasons, when sent to the upper provinces) are rendered almost useless in the dry weather and hot winds, from the excessive shrinking of the wood; with different materials for the naves, the Bengal Members are disposed to think, that the whole machine would, under like circumstances, become disjointed and rendered unserviceable with a much more moderate variation of climate, and that the same degree of shrinking in the wood work, which would only render a wheel of the present construction repairable, and leave it capable of being set up with the original materials, would, with brass naves make it necessary to replace a considerable portion of the wood work.

As far as the Bengal Members have been able to discover, no practical facility is afforded by the construction of the Madras wheel either in repairs or setting up. The same

operations are required, whether to replace unserviceable spokes and felloes; or to set up the wheel in both constructions. It has indeed been urged, that new spokes cannot be substituted in old wooden naves, but this is a mistake, for a wooden nave may wear out several sets of spokes, provided proper care is used in removing the old ones; a new nave cannot indeed be fitted to an old set of spokes with great accuracy, but the Bengal Members observe that wooden naves are so seldom worn out before the felloes and spokes, become unserviceable, that they in the course of 30 years in which they have both served, cannot bring to remembrance an instance of a wheel being condemned by competent authority from defective naves only, instances have been known of unprofessional committees condemning naves when split, as being thereby rendered unserviceable, and it is sometimes urged as a disadvantage of a wooden nave, that this is often necessary, but it has been proved in Bengal that a nave, even when split into 3 or 4 separate pieces performs its part well, so long as the nave bands stand and are firmly attached to it, nay, it has been satisfactorily established, that a wooden nave may be made sufficiently strong for our largest carriages when originally composed of 3 or 4 sound pieces of wood if the bands are perfectly fitted to it, and one object in adapting the present barrel shape of the Bengal nave was, the facility it afforded of tightening the bands, by a simple operation like hooping a barrel. An advantage of a wooden nave over a brass nave cannot be overlooked, viz. the means of replacing a box when it is worn out, and as the boxes of both are the same size, and subject to at least equal friction, this must be expected to happen to both, but in a wooden nave this change is effected with ease, without altering in any way the rest of the construction of the wheel, whereas in the proposed nave, the whole must be re-cast, and the wheels must be taken to pieces, and even were the box of a metal nave, made as they are at Bombay to shift, this latter operation would be necessary.

Under all these considerations, the Bengal Members cannot but entertain the greatest doubts whether any advantages are to be obtained in that presidency, from the introduction of metal naves, for there has never been any difficulty in procuring abundant supplies of wooden ones, at a cost of about  $\frac{1}{4}$  of the brass naves, including the value of the box.

A Transport Carriage nave costs Rs.	8	0	0
Box	20	1	9
			9
	Rupees	28	1

A brass nave and box complete, will cost about 80 Rupees for a field piece.

A field piece wooden nave costs Rupees	4	8	0
A box for do do do	12	0	0
			0
	Rupees	16	8

The Bengal Members therefore, though they have no apprehension of the strength, and foresee no difficulty in the substitution of brass for wooden naves, should Government think it necessary, in furtherance of the objects contemplated in forming the Board; conceive it their duty to record their opinion that it may be attended in that presidency with great inconvenience and expense. The former object they consider to be that, more immediately liable to their observation, which if at all commensurate to their present ideas on the subject, would in their judgment become an insuperable objection to the introduction of the change, and they therefore suggest that the earliest opportunity may be taken, of sending some of the original wheels, as received from Madras and Bombay to Major Lumsden at Futteghur, that their state on arrival there, and after being subjected to the influence of the hot winds may be carefully ascertained.

The Bengal Members however, observe that the axletree arm must be made longer than has been proposed by the Board if wooden naves were retained, and as fully as long as

the axletree arms of the present Bengal axletree, but the body of the axletree need not be altered.

GOVERNMENT HOUSE, } (Signed) P. TENNANT, Lt. Col.  
 FORT WILLIAM, }     "   C. GRAHAM, Lt. Col. H. A.  
 27 January, 1838, }

MINUTE BY CAPTAIN SETON, MADRAS HORSE  
 ARTILLERY.

The Bengal Members having considered it incumbent on them, to record their apprehensions in respect of the suitability of brass naves to a particular climate in India; I consider it right that I should briefly state the result of my own experience with wheels on this construction, and which reaches back to the year 1816, when I first joined the mounted branch of the Madras Artillery. During the whole interval between that period and the present time, this mode has been in constant and exclusive use with the Madras Horse Artillery, and I have had the most ample opportunity of bearing witness to its perfect efficiency under every species of trial, as well as those arising from having to travel at times over the worst description of roads, as from exposure under every variety of circumstances, and seasons; and to all climates existing between the Carnatic and Mysore, on the one side, and the Northern portion of Malwah on the other.

I can most unhesitatingly affirm, that I have never myself experienced any defect or inconvenience in wheels so constructed; nor have I ever heard of any having been at any time ascribed to them in the experience of others.

That their efficiency attracted notice at a very early period, may be gathered from the following extract from a letter dated Poonah 24th April 1803, from the Duke of Wellington to Lieut. Genl. Stuart. "There is not a serviceable wheel in the whole detachment, excepting those in Capt. Scott's form, 6-pounder carriages and tumbrils."

The above was written immediately after a long and rapid march and the peculiarity of the construction referred, to is

that which has been in use with Madras and Bombay Horse Artillery, and the general introduction of which has been now recommended by our Board.

No valid objections can be made to the brass naves on the mere score of expense, for on any estimate that can be formed, the difference of cost between them and those made of wood, is far too trifling to admit of being viewed as of any importance in a matter so essentially involving efficiency.

But I apprehend that a reference to records, will not shew that the Madras Carriages are disproportionately expensive, but rather the reverse.

The whole outlay for brass in the construction of a Horse Artillery 6-pounder and limber at Madras, including of course metal for the naves of 4 wheels is Rupees 111-9-8.

No difficulty whatever is experienced in casting these naves there, and certainly none need be anticipated on the Bengal side, with the means afforded by the foundry at hand.

As these naves are not in use in England, and as the expediency of adopting them in Bengal has now been questioned, my main object in making this record, is to remove any misapprehension that might arise as to their being of recent introduction in other parts of India; and of our having recommended for adoption in this instance, what may not have had its general fitness and efficiency guaranteed by sufficiently extended experience.

CALCUTTA, } (Signed) R. S. SETON, Captain,  
 March 5th, 1838. } *Madras Horse Artillery.*

#### MINUTE BY THE BOMBAY MEMBERS.

Our Bengal colleagues having recorded in a Minute appended to these proceedings, that from the experience they have now had in constructing wheels with brass naves, and the knowledge thereby acquired of their construction, they have been led to entertain great doubts of the propriety of generally introducing them into the service of the Bengal presi-

Sketches shewing the method of fixing the Spokes in Brass and Wooden Naves.

fig: 1.

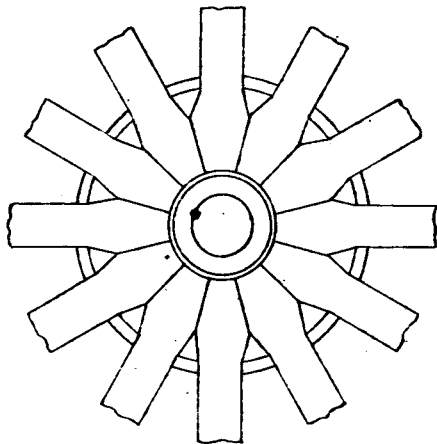
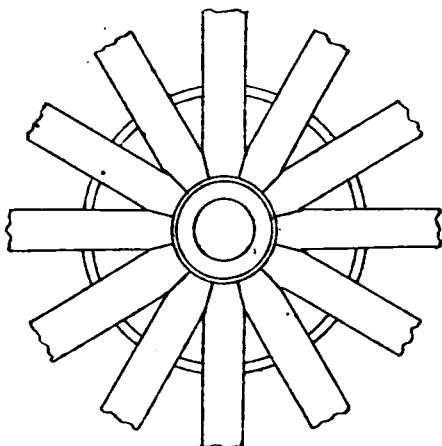


fig: 2.





dency, and assigning their reason for entertaining such doubts ; it becomes our duty to record the opinion we have formed in the course of our long experience with metal nave wheels ; of the advantage, which they possess over wheels with wooden naves, and our reasons for advocating their adoption for Artillery Field Carriages in India ; premising however, that the retention of different descriptions of wheels and axletrees under different presidencies would render nugatory one of the most essential objects for which this Board has been called together, as in our opinion, there are no parts of Artillery equipments (the Ordnance being all alike) which requires a more rigid adherence to uniformity than wheels and axles.

The first objection made to brass nave wheels is the difficulty of construction. This we conceive may be answered by the fact, that no difficulty has ever been experienced on this point, during a long period of 30 years that metal naves have been in use at the sister presidencies of Madras and Bombay. We must here remark, that the cutting of the tenon of spokes, and the mortices in wooden naves for their reception, is deemed by wheel-wrights in England a work of considerable art, because the tenons in the nave depend wholly for their firmness, on accurate workmanship. In this view, we conceive that with regard to simplicity and facility of construction, the metal nave wheels will be found to possess decided advantages, over those with wooden naves.

It is considered by our Bengal colleagues, that if the naves be of metal, and the spokes and felloes of wood, all not being liable to equal expansion and contraction by variations of climate, a wheel so constructed, would soon become disjointed. On this point we beg to refer to the annexed drawing Plate II, for a comparative view of different forms given, and modes of fitting the spokes to the naves to the two descriptions of wheels. It will be observed, that with metal nave plates the spokes are radii to the periphery of the wheel, conveying to and filling up the entire space between the nave plates.

The spokes being uniform in figure, form a complete arch, whereby they firmly support each other at this part, and give stability to the whole of the wheel. From the figure given to the spokes, used with metal nave plates, Fig. 1, they can at all times be restrained in this part in the most perfect order, the base being of greater breadth than at the shoulder, they cannot be drawn upwards from the nave plates by any contraction of the felloes in their depth, and the triangular bolts, serve also to connect the plates and spokes firmly together, hence the construction at this part affords greater solidity than in a wheel with wooden nave, the thickness of the spokes between the nave plates, answering more effectually the purpose of solidity and unity, than can possibly be acquired by their insertion in separate mortices, in a wooden nave; for in the latter description of wheel, unity of the wheel soon becomes destroyed by the shrinking of the two parts, the felloes and the naves in dry climates.

If the spokes used with brass naves, shrink in their breadths, sheet lead or common country leather may be interposed between them and the nave plates, and if the shrinking should be in their thickness, pieces of wood corresponding in the dimensions with the openings between them, may be driven in, the triangular bolts will retain these pieces in their places, and by tightening the nuts of the bolts the wheels may at all times be kept as firm at the nave, as on the first day of construction.

Now if we compare a wheel as constructed by the Board, with one as made in Bengal with a wooden nave, Fig. 2, it will be seen that when the nave shrinks in its diameter, and the felloe in its depth, each of these parts, by the contraction of their fibres towards their centres, cause a separation of the composed parts, the felloes, spoke and nave, and a disorganization of the wheel leading to their destruction must follow. It has been remarked that the greatest accuracy is required in fitting the tenons of the spokes to the mortices

of the naves, now the figure given by artisans to the spokes at the naves, and to drive it home, and to enable them to give firmness to the wheel when first made, is the very one that affords the least hold to resist their separation when the felloes and naves shrink. The form of the spokes being that of a wedge tapering to the interior of the nave, as the drawing force tending to a separation of these parts, is exerted in a greater degree at the felloe than at the nave, in consequence of the spoke being wedged into the felloe, it must follow, that the disorganization of a wheel, with a wooden nave commences with the latter part, and it will be seen from the mode of their being fitted to each other, that when this takes place, the only remedy available, is that of lessening the diameter of the tire, and re-tiring the wheel, an operation which only need be resorted to with metal nave wheels when the felloes shrink from the tire, and which must also be followed under similar circumstances with wooden naves, for it has been shewn, that the spokes may at all times be retained in perfect order between the metal nave plates of wheels so constructed.

It is on record that the shrinkage of wheels with wooden naves made in Bøngal, when sent to Futteghur was as follows, the naves were reduced in diameter  $\frac{1}{2}$  an inch, the felloes  $\frac{1}{8}$ th in depth, and  $\frac{1}{8}$ th in breadth, and that the spokes shrank both in breadth and thickness, but the extent is not mentioned, neither is their shrinkage in length noticed; from which we may infer, that if there was any it was to a very inconsiderable extent, an inference which accords with practical results; as woods chiefly shrink but very little in their length in comparison with what they do in their breadths and thicknesses. These observations are given in support of our argument, that wheels with wooden naves however well put together when newly made, become disorganized in the first instance by the separation of the spokes and naves, arising from the shrinking of the latter from the former; and as the figure of the spoke tenon affords no other means of bringing these parts

together, than that of re-tiring the wheel, we consider this operation is more likely to be required, and more frequently to be executed, than would ever be demanded or found necessary with metal nave wheels.

We will now see in what manner the operation of re-tiring wheels affects their original form and strength.

We have observed in wheels with wooden naves, that have undergone the operation of re-tiring, or of having their tire rings reduced for the purpose of forcing the spokes into the nave up to their shoulder, that the dish or angle of introduction of the spokes becomes greater and greater every time the separation is repeated, as the mortices and tenons of the spokes are accurately fitted to each other to form the original dish, the increased angle of inclination can only arise from the wearing away of these parts, hence the spokes and naves can have no firm hold of each other, and the wheel from want of cohesion in its parts must soon become unserviceable.

As the proportionate shrinkage of the same woods of different dimensions, is in increased ratio to their dimensions, as their increase, and as the spokes are of greater breadth and thickness at the nave end in metal naves, this part of the wheel must consequently be less liable to derangement than when wooden naves are used; but even allowing for the sake of argument, that the shrinking in breadth and thickness in metal naves to be double or more than in wood, there will still be these advantages in the former over the latter: a constant and firm union of the parts from the mode of construction; and by the modes of effecting this, noticed in a former paragraph, means are afforded of retaining the dish or inclination of the spokes at the same angle, as fixed when first made, and thus the proper bearings and supports of the different parts in their true positions, will ensure the unity and consequent durability of the whole wheel.

Although wooden naves may be very durable, and from being barrel shaped, considered as strong, when composed

of two or more pieces, as when cut out of a solid, yet, for the reason assigned, we must differ in opinion from our Bengal colleagues as to their efficiency in comparison with metal nave wheels, and because that we believe from the want of proper cohesion of parts in the former, there is in them a far greater expenditure of spokes and felloes than in the latter.

There is probably at present a great expenditure of these materials at Madras and Bombay, but this may easily be accounted for, Teak wood has of late been used in wheels, as in other parts of the carriage. The Board having pronounced in the strongest terms, their opinion of unfitness of Teak for the purpose, and as an amendment to the suggestion offered by our Bengal colleagues, that Madras and Bombay wheels, should be sent to the upper provinces in order to ascertain the effects of climate on metal nave wheels, we would beg to propose, that brass naves should be sent to Fytteghur, with instructions to the Carriage agent, to make up a number of wheels of the prescribed woods equally seasoned, half of the number being with brass naves, and the other with wooden naves, and that these wheels be exposed at the same periods, and under similar circumstances. We propose this, because the Teak wheels sent with the experimental carriages from Madras and Bombay, have already cracked and split from change of climate and exposure in Bengal; but as we have said before, these injuries to the wheels have arisen from the use of Teak in their construction, and it is relevant to add, that wheels made in Bengal even with the best materials are found to be so much acted upon during the transmission to the upper provinces, as to require a thorough repair and setting up on their arrival there.

Our Bengal colleagues have adverted to the facility of changing the axle boxes in wooden naves, under an impression that when the interior of the metal naves becomes worn, the whole must be recast. This however will not be necessary, as there are various ways of meeting the objection;

firstly, by casting the box separate from the nave plates; secondly, by introducing brass boxes, corresponding with the bearing surfaces, on the axle arm, and securing them by screws to the nave plates. In any case new boxes may be tightly fixed and secured, by any of the simple methods in common use with every description of machinery. We are of opinion, however, that constructed as the metal nave wheels are, there is neither that play, nor uneven severe friction, between the axle and box, as there is in wooden nave wheels, in which the boxes are constantly separating from the wood, and that the former would last, without perceptible alteration (being of gun metal) for a much longer period than the latter would cast of brass. We believe that the durability of a brass nave box in Bengal, may be taken at 10 or 15 years, and that of the gun metal nave boxes, attached to the metal naves, might safely be taken at 20 years under similar circumstances, so that the facility of repairs in either is not an object of such importance, as to demand any particular attention.

We may here remark as relevant to the subject, that the opinion formerly entertained of the advantages arising from the use of brass boxes, with iron axles as causing the least friction, has from more recent experiments in England been proved erroneous. It appears from the experiments, many hundred in number, conducted with the greatest care, and repeated several times to obtain correct results, that bearings of brass and cast iron were both used, and that the latter evinced in every experiment, less friction than the former, to the amount of  $\frac{1}{15}$ th. part.

Wrought iron axle cases, hardened, were used with the cast iron bearings, under these results it would appear desirable that axle arms case hardened, and cast iron boxes should be used in Ordnance carriages, as is the case in all public conveyances and domestic carriages in England, and in this country; the cast iron boxes would certainly last longer, than

those of brass or gun metal, the draft would be easier, and if the Government decided on the alteration, there would be no difficulty in attaching them to the nave plates or fitting them to the axle arm.

With reference to the comparative cost of wood, and brass naves, we have to remark, that when the subject of wheels was discussed, with a view to economy, that as cast iron naves cast in the Bombay gun carriage agency, had been many years substituted for brass naves for Ordnance Carriages under that presidency, that the term "metal nave" should be used in our record instead of "brass nave." This was agreed to by the Board, but the Supreme Government were pleased to determine in favor of brass naves for general adoption, from which we are led to conclude, that the original cost of the relative materials, whether of wood, or cast iron, or brass, has been taken in consideration, as also the ultimate value of the latter when worn out, a contingency judging from past experiences, which must be fixed at some very remote period.

The durability of brass and iron naves may probably be taken as equal, while the original cost of the first is greater than the second, as is also its ultimate value, as old brass when worn out. We consider these metals to be equally well adapted for nave plates, and if the question is to be determined by expence, we would rather give the preference to cast iron, and for these reasons, because its original cost would be less, and next, because it can be more easily made in a gun carriage agency, which has or ought to have, the means of casting moderate sized work in iron. The figure and dimensions being precisely the same in both instances, there is this difference in constructing them, brass nave plates are cast in the solid, and the laborious and protracted operation of turning them down to their exact dimensions, must be first gone through, after which the circular and triangular bolt holes must be made by filing, but in the making of cast iron nave plates, these operations are not necessary, as the plates are received from the mould of their proper figures and dimen-

sions, with all their perforations ready and requiring only to be cleaned a little with a file.

It is true that native establishments attached to batteries, cannot be looked to for the supply of cast iron nave plates and boxes but as it is known that they can cast in brass, no difficulty need be apprehended on this score; if accidents should occur on service, requiring nave plates to be replaced, which from past experience, may be considered not likely to be of common occurrence, brass ones might be easily made by them, and substituted for the occasion; but we may add, that spare nave plates and boxes, whether of gun metal or cast iron, might easily be provided in addition to the spare wheels if deemed necessary, and that these spare plates would not occupy the space, nor be of the weight of the quantity of metal required, to cast these articles in brass, while the spare nave plates and boxes whether of iron or gun metal, would at once be ready for immediate use.

These remarks on the construction of wheels, naturally lead us to the consideration of the mode in which the felloes of wheels are cut out of the timber, and formed into the curved shape required in the gun carriage agencies throughout India; and as we felt that this portion of the construction is very faulty and capable of remedy, we have most earnestly to solicit the attention of Government to the following observations.

As the strength of wheels depends upon the accurate fitting of their component parts, and the mode of arranging them with reference to the direction of their fibres, that one support may be given to resist severe strains and shocks to which wheels are subjected in travelling and in firing; it will be observed that in their construction attention is required in the points noticed, and that the placing and union of the different parts, so that the strain may act upon the fibres of the wood in the most advantageous direction is of importance, and should be attended to.



The felloes being axis of the circle forming the wheel, it is requisite that the fibres should run as continuous as possible, in the direction of their curves; but as timber cannot be procured, with the degree of bend adapted to these curves, the felloes are now cut out of blocks of the form required, without reference to the direction of the fibres; and hence we find, that the felloes are constantly splitting, occasioning great inconvenience on service, and a vast expence to the State for repairs. Teak is already stated as in use under the Madras and Bombay presidencies for felloes, but experience has proved its unfitness for this, as well as for other parts of Ordnance Carriages, noticed in our proceedings, and although Sissoo is much prized in Bengal, yet from its being more or less straight grained, is proved liable also to the evil we have mentioned.

From past observations, and from a minute examination recently, of a great variety of wheels, we are satisfied that the splitting of the felloes, which almost invariably commences at the point of junction with each other, arises from a want of continuity in the running of the fibres, in the direction required by the circular form of the wheel.

To obviate this inconvenience in England, the felloes instead of being cut out of the block into the required shape as in India, are made from Ash and bent into the required shape by means of Steam, and by this mode of forming them, the continuity of the fibres in the curved figure of the felloes is insured.

This mode of constructing wheels has long been practised in England, and we feel convinced that both efficiency and economy in reducing the amount of repairs, would arise by its adoption in this country.

(Signed) J. STEVENSON, *Lt. Col. Horse Arty.*  
 ( „ ) W. WHITLIE, *Bt. Capt. Horse Arty.*

## APPENDIX B.

COPY.

*Madras 22nd September 1853.*

From,

Conductor J. CURRAN,  
*of the Gun Carriage Manufactory,*

To,

Major J. MAITLAND,  
*Superintendent of the Gun Carriage Manufactory*  
*Madras.*

SIR,

I very respectfully beg to submit for your consideration a Brass nave cast in three pieces possessing I think advantages that the nave cast in two pieces does not, with a view that should you consider it worth the attention of the Artillery Select Committee it may be laid before them.

2. This nave is composed of the Top and Bottom plates and the box or socket for the axle arm separate; it is the same shape in every respect as the present nave in two pieces: the following are the weights of each or the component parts.

	lbs.	ozs.
Top plate.....	24	4
Bottom plate.....	21	8
Box or Socket...	15	2
	<hr style="width: 50%; margin: 0 auto;"/>	
Total...	60	14

3. Its chief advantages are.

1st. It obviates the objection of the Bengal Artillery to brass naves when they say that when worn in the Box the whole nave must of necessity be condemned. In the proposed mode of casting the naves the Box alone need be removed and replaced by a new one as in the case of worn out boxes of wooden naves.

2nd. The wear of the nave being only in the box, the top and bottom plates become almost perpetual, for on the removal of the box the nave becomes as good as new again.

Srd. As a matter of economy instead of Brass for the tops and bottoms, cast Iron may be used which will diminish nearly  $\frac{3}{4}$ ths. of the quantity of brass required for brass naves.

4th. There will be less loss and the castings will be more perfect on account of a less mass of metal being required for each component part, the liability to flaws and defects will become less because smaller bodies can be cast more perfectly than larger ones—In the present mode if a defect occurs in the bottom plates, 60lbs. of work must be condemned and recast whereas in the proposed mode of casting no part will contain more than 30lbs., there will be no additional labour or expense and the nave will thus be rendered more efficient than the present one.

I beg to remain &c.

MADRAS, }  
22nd Sept. 1853. }

(Signed) J. CURRAN, Conductor,  
*Gun Carriage Manufactory.*

(True Copy)

JAMES LAWDER,  
*Acting Assistant Secretary.*

## APPENDIX C.

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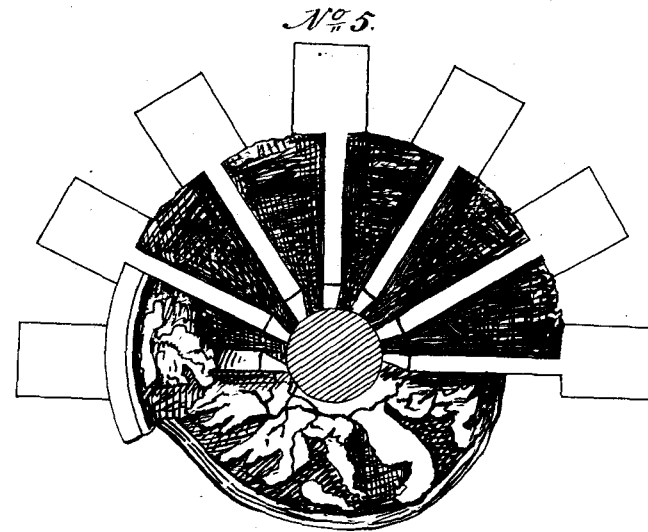
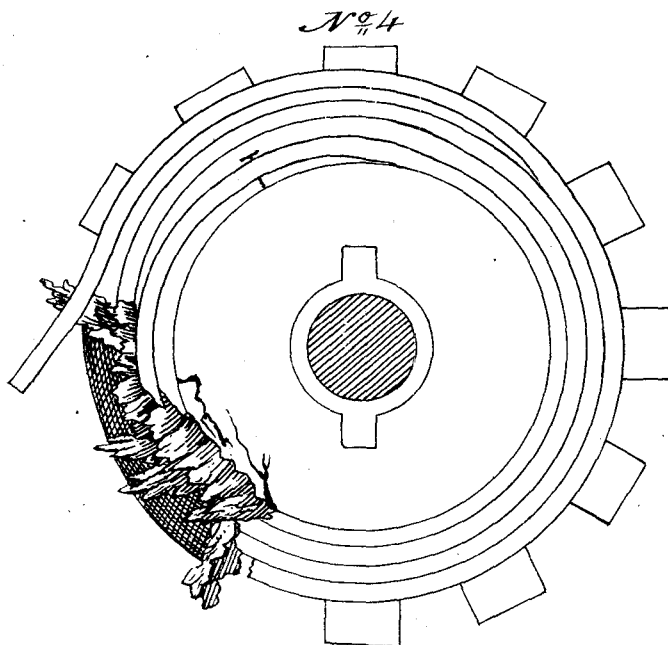
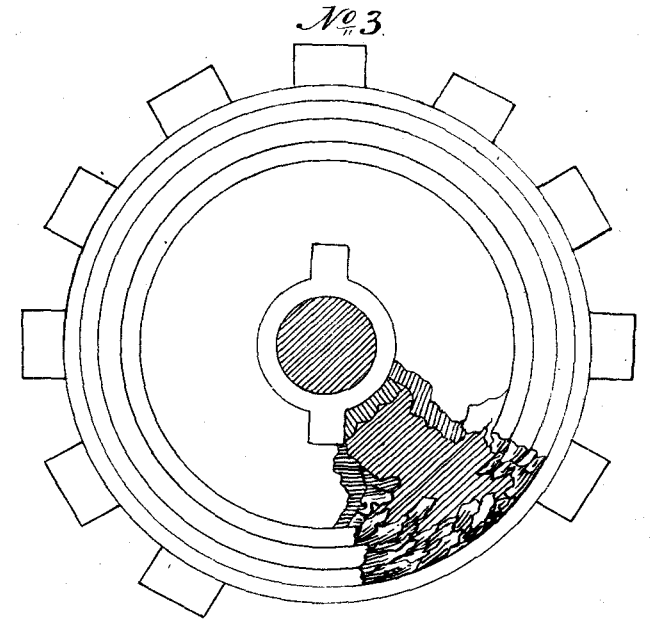
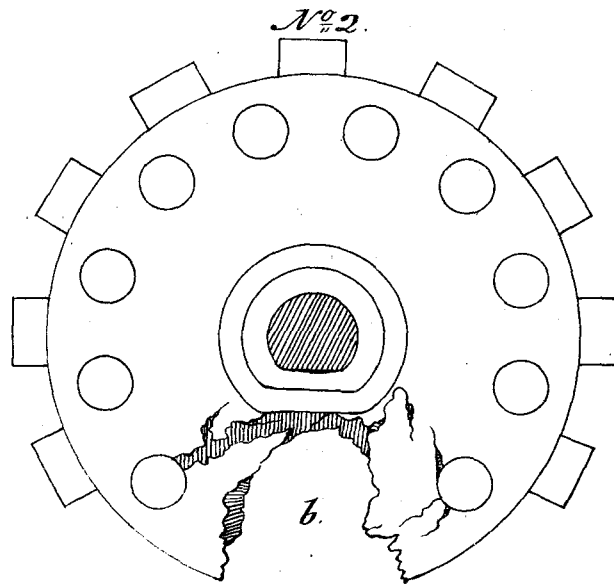
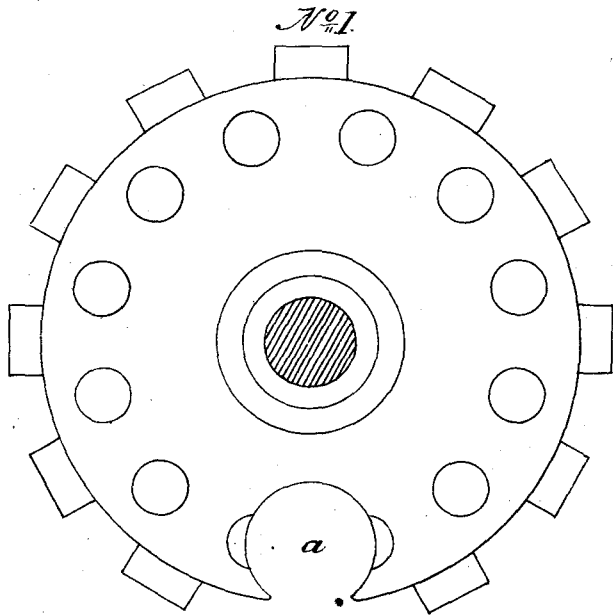
Experimental Practice to ascertain the effects of Round Shot on Metal and Wooden Naves, both as affecting the stability of the wheel and the safety of the Detachment from splinters &c. (Plate 12.)

In accordance with the desire of His Excellency Sir P. Grant K. C. B., the Commander-in-Chief.—Experimental Practice as follows, took place in the Range at Artillery Head Quarters in the month of April 1857, to ascertain the effect of round shot fired against Brass Naves in use with the Madras Light Field Artillery, and the wooden naves in general use in Bengal, and also with Heavy Field Artillery in Madras.

1st. Two Shot from 6 Pdrs. at 300 yards distance struck a Madras metal (Brass) nave, sketch 1; the first shot struck the outer edge of the plate and cut its way clean through, leaving a hole exactly of its own diameter (*a*)—The nave and wheel remained firm, and would have travelled notwithstanding.—The second shot struck nearer the centre on the same side of the same nave, sketch No. 2, grazing the projecting edge of the fixed Nave box and cut out a larger piece, still of the shape of the shot, with the surrounding edges partially broken off (*b*.) and 4 spokes carried away; but had not the tire, fellies and remaining spokes, been damaged by other shot, the wheel would apparently have continued to travel, sufficiently at least to reach a place of safety, even with this second hurt.—The whole of the rest of the nave and spokes remaining compact and unmoved, except where struck by other shot.

2nd. Three shot from the same pieces at a similar distance struck three wooden naves (each once only) of an old Heavy Field 12 Pdr. Carriage; the wood of the naves of which was

Sketch shewing the effects of Round Shot on Metal and Wooden Naves.



proved to be tolerably sound,—although the fellies had quite perished.—The first shot struck the face of the nave No. 3 fair, just within the Nave bands, and tore its way through the Nave leaving a large cavity and carrying away the rear nave box,—The whole wheel was dislocated—the spokes all involved in the damage, and with a weight on it, if not at once, certainly on movement, it would have fallen to pieces.—The second No. 4 struck on the outside swell of the nave,—cut both nave bands, and glancing off carried away three spokes; but it probably would have travelled for some time notwithstanding if not otherwise injured;—The third, No. 5, struck the edge of the nave band, and sliding inwards towards the centre, tore away the rear nave box and all the surrounding wood, laying bare the spokes in their mortices and the wheel a useless wreck.

The brass nave where struck was carried away in few and large pieces,—the wood on the contrary in innumerable splinters of varying size, which strewed the ground for some paces to the rear of the wheels.

The evidence thus obtained of the advantage of metal over wooden naves, in the particular points investigated by the above experiment, in addition to the numerous other points of superiority established by the results of upwards of 50 years uninterrupted use in the Madras Artillery, and repeatedly and clearly set forth in detail in the proceedings and discussions of the special Board of Artillery Officers in Calcutta in 1838-9, and subsequently in those of the Madras Permanent Artillery Select Committee, render it a matter of surprise and regret, that the former are not universally adopted, and wooden naves discarded except for Heavy Field Carriages and carts for transport of all kinds &c,

(Signed) G. ROWLANDSON, Major,  
*Director Artillery Depot.*

## COPIES.

MY DEAR COLONEL,

The Commander-in-Chief has inspected the naves and is quite confirmed in opinion that the Brass is infinitely superior to the wooden one.—The force of the shot seems only to affect the first on the spot actually struck—whilst the whole frame of the wooden one seems shaken by it.

Sir Patrick would like to see the Report when printed for your Records.

Yours &c.

30th April 1857

(Signed) F. HAINES,

MY DEAR BRIGADIER,

This is indeed a very interesting and very valuable experiment, and well deserves being recorded, indeed I should like to see it communicated to Bengal and Bombay, for it is so conclusive as to the advantages of the Brass Nave.

Yours &c.

(Signed) G. BALFOUR.

## APPENDIX D.

On the construction of Wheels and the form of Axles.

The following extract from a paper read at a Meeting of the SOCIETY OF ARTS\* on the construction of Wheels and the form of Axles, will doubtless be read with much interest, as the established plan for constructing the highly efficient wheel of the Madras Artillery, coincides in a remarkable degree with much that is advocated by the author of this paper.

“ The SECRETARY stated that he had received the following communication from Mr. W. Bridges Adams :—

“ The machinery at Woolwich Arsenal for the manufacture of wheels for gun and other carriages, is fast approaching perfection, but the wheels themselves are still the rude primitive constructions, as regards principle, that Thespis might have used in his original cart. A lump or hub of timber is cut from the butt of a tree. A series of levers are fixed round it, capstan bar fashion, but without the proportioned strength of the capstan bars, each of which is equally strong all over, whereas each spoke is so reduced at the tenon, or holding part, where it enters the hub, that it would break short off if unsupported. The extreme ends of the levers are framed into the fellies, or string segments, two and two, in such wise that the spokes must be made weak in the direction of the plane of the wheel, in order to draw them together, to enable the extremities to enter the mortices. The fellies, where they abut against each other, are dowelled into short cross grain, produced by the curved form, and constantly break off at what are technically called the ‘ chins,’ and loose segments of iron bar, technically called ‘ strakes,’ are spiked on to the felly ‘ break joint.’



“ Such wheels as these are now only to be found in remote districts, and the only apparent reason why they are continued in government artillery, is some fancied facility of repairs when damaged in use in the field.

“ These wheels are so applied to the axletrees, that the lower spoke presses vertically on the ground, in order to prevent side rack and strain. But the result of this is a total absence of elastic resilience. As the wheel revolves with its load, blows from the irregular surface of the ground, act like tilt hammers, and drive the spokes partly into the hub, and partly into the fellys, but most into the hub because it is the softest wood, rendering the whole loose. But there is a worse evil than this. No hub is equally hard all round—the weather side of the tree is the toughest—consequently the spokes drive unequally, the wheel becomes eccentric, and the irregular action is like that of a sledge hammer, rapidly destroying it.

“ When this class of wheel is improved, as in the ordinary omnibus, by shrinking on a hoop tyre, there is another difficulty. The spokes are thinnest in the direction of the plane of the wheel, and if the shrinking be too severe, they lose their straightness, and tend to lap round the hub, weakening the structure. As the hubs are not of equal hardness, scarcely any two wheels are alike in dish or diameter. If the spokes do not yield in the direction of the plane of the wheel, but are forced over in the direction of the axle or ‘dish’ the tendency is to draw them forward, and leave gaps in the hub behind. When the diameter of the wheel is thus lessened, the tyre gets loose, and is then ‘cut and shut,’ to reduce it in diameter, and the gaps at the backs of the spokes are increased.

“ Criticism is of little use, unless the critic has a remedy to offer. My remedy is first to dispense with the hub altogether, and mitre the spokes together at the centre in an

arch form, bolting them between strong wrought iron disc plates front and back. The section of the spokes is such as to leave twice the strength in the direction of the axle. Each spoke has a single felly, the joints being between; the fellies being short there is no cross grain to break off the 'chins.' No dowels are applied, but instead of these a thin piece of narrow hoop iron is inserted in a saw kerf, half in each felly, which keeps them in plane, while the tyre is shrunk on. No shrinking of the tyre can damage the wheel, for the elastic resilience is in the direction from back to front, tending to produce a ribbed dome-shaped, the true form of a wheel.

"I had come to the conclusion from theory that every spoke ought to have its separate felly, just as every leg has its separate foot, independently of the obvious disadvantage of straining the spokes to get them into the double felly. But I also obtained practical evidence of it.

"Watching on one occasion the pulling to pieces of a pair of large Hausom cab wheels, the fellies of which were made of hard wood, I found almost every double felly had separated into two parts, equi-distant between the spokes, forming, in fact, single fellies, and the separations were as clear and peculiar as the sutures in a skull bone, scarcely showing on the external paint. The reason was obvious. The wheels being of larger diameter, and revolving rapidly, the alternate blows at the ends and centres of the fellies concentrated the vibrations at the centre, precisely in the mode in which axletrees break after long service. Each spoke served as a fulcrum to produce this effect. It was therefore clear that the structure which the wheel tended to generate in action, was the true structure to begin with, unless the fellies could be made in an entire solid piece.

"I tried this experiment also, constructing the wheel centres of mitred spokes, disc plated, and the fellies of a hoop

of angle iron, into which the spokes abutted and were very carelessly secured by staples round them, rivetted into the angle iron. The wheels so made were placed under a cart, to carry heavy loads of iron. After being a considerable time in use, one day the angle circle escaped from one of the wheels. The driver lifted it into his cart with the rest of the load, and drove home on the spoke ends, which, when he arrived, bore the appearance of overworn crutches. The remark of one of the initiated in wheels on beholding this was, 'No wheel that ever I saw before could do that.'\*

"It is obvious that a true circular form can be preserved by this kind of centre, but there is another advantage. The wheel, being dome-form, will be elastic, and if the axle be horizontal, the spokes will never be vertical to the ground. Consequently the result will be a spring action, diminishing draught and injury to the horses, while ensuring far greater durability. It will be as though a man alights upon his toes instead of his heels in jumping from a height.

"I frequently conversed with the late Colonel Colquhoun of the Woolwich Arsenal, on this subject, and he agreed with me in the principles, but the application involved such a radical change, and a new teaching in all departments connected with the working and repair of wheels, that he considered it preferable to go on in 'the old way.'

"It is, however, a most important matter, and the facility of repairs in the field would appear to be quite as great as with the primitive wheel. By means of an efficient screw tool, this wheel could be compressed into the cold hoop tyre in the open field very rapidly, and the parts being all duplicates, no error could occur. I think common labourers would be adequate to the work after a few weeks' practice.

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\* The disc centre alluded to was not originally an invention of mine. It was first used by Mr. Walter Hancock in his steam carriage, but not as a dished wheel, only as a cylindrical wheel—If I mistake not there is a model of a disc mitred centre wheel in Woolwich Arsenal.

Observations on "Military Notes written at Secunderabad India by W. B. E. Ellis, Lieutenant Royal Artillery," by Captain G. Carleton Madras Artillery.

Bangalore, April 27th, 1861.

To,

*The Editor Madras Artillery Records.*

SIR,

In the January and February Records for this year appears a reprint of "Military Notes written at Secunderabad" by Lieutenant Ellis Royal Artillery.—The notes were it seems written early in 1860, so it is not improbable a revised and amended edition of them may have since appeared; if not, I hope as rather an old Indian Artillery Officer the observations I propose to offer on these notes may not be taken amiss. At present I propose for remark only two propositions, both advanced in the February number of the Records.

At page 1074 Lieutenant Ellis says, "I propose 8 horses as the team for the 9 Pdr., and the team for the 6 Pdr. at present used by the Madras Horse Artillery consists of 6 horses." He then continues "The weights that each horse would have to draw would be therefore as follows.

Madras 9 Pounder

Madras 6 Pounder.

Cwt. qrs. lbs.

Cwt. qrs. lbs."

4 ... 1 ... 20.5

5 ... 0 ... 7.

These figures appear to have been got from the Madras Gunners' Assistant, page 20, where the total weights of 9 and 6 pounder guns with their Carriages and the limbers packed are correctly given at Cwt. 35...1...24, and Cwt. 30...1...14 respectively, and to find what each horse draws as above shewn, these total weights have been simply divided by 8, and 6 horses respectively, and the result named as what each horse draws. I beg to refer the reader of these remarks to the Madras Artillery Records for July 1857, in which it is upon the Prussian General Scharnhorst's estimate shewn, that in a team of 6 horses harnessed in pairs, each horse of the front

pair draws in a Madras 6 Pdr. gun about 316 pounds, or nearly 3 Cwt. less than each horse in the pair next the Gun, and 197 pounds less than the horse next behind him; it was calculated by Scharnhorst that the centre pair only draw  $\frac{1}{8}$ , and the front pair  $\frac{5}{8}$  of what the wheelers do; now secondly, to compare the 9 Pdr. drawn by 8 horses with the 6 pounder drawn by 6 horses, the principal difficulty here consists, in finding the ratio that the two front horses in a team of 8, (two and two abreast) bears to the two pole horses; now the ratio of the second pair to the pair next the gun is  $\frac{5}{8} : 1$ , that is  $\frac{5}{8}$  the ratio of the third pair to the second pair is  $\frac{5}{8} : \frac{5}{8}$ , that is  $\frac{10}{8} : \frac{15}{8}$ , that is  $\frac{10}{8} = \frac{5}{4}$ ; here the ratio of the second pair to the first pair is  $\frac{5}{8}$ , and the ratio of the third pair to the second pair is  $\frac{5}{8}$ , so we have 1,  $\frac{5}{8}$ ,  $\frac{5}{8}$ , and the next term of the progression, that is the fourth pair in a team of 8 would be  $\frac{1}{8}$  the common difference, being  $\frac{1}{8}$ , therefore the 2 front horses in a team of 8 would have a draught of only  $\frac{1}{8}$  that of the third pair, or of those immediately behind them, or  $\frac{5}{8}$  of the pole horses; now we have  $1 + \frac{5}{8} + \frac{5}{8} = \frac{10}{8} + \frac{10}{8} + \frac{10}{8} = \frac{30}{8}$  equal power of 6 horses, and  $1 + \frac{5}{8} + \frac{5}{8} + \frac{1}{8} = \frac{10}{8} + \frac{10}{8} + \frac{10}{8} + \frac{1}{8} = \frac{43}{8}$  equal power of 8 horses; according to which it would appear, the power exerted by 6 horses thus harnessed is to the power exerted by 8 horses similarly placed as 43 : 48, hence we can find the power necessary to measure a 9 Pounder with the same facility as a 6 Pounder gun.

6 Pdr.		9 Pdr.		
Cwt.		Cwt.		
30·375	:	35·464	::	43
		43		

$$30 \cdot 375 \overline{) 1524 \cdot 952} (50.$$

$$1518 \ 75$$


---

6 202

equal say 50.

Now as 48 is the force exerted by 8 horses, and as it would require a force of 50 to manœuvre a 9 Pdr. gun with the

same facility as a 6 Pdr gun with 6 horses, it therefore would seem the 6 horses with the 6 Pounder gun, have the advantage of 8 horses in a 9 pounder in the ratio of 50 : 48 or 25 : 24. In the above comparative estimate it must be remembered straight forward pulling draught only is taken into consideration, but if we consider the great proportion of draught that is got through in the various very sharp turns required in quick manœuvring, such as is incident to Horse Artillery, when the horses in front of the wheeler may be considered for the time being, not only lost, but at times a hindrance, it will be easily understood how great must be the waste of power in a team of 8, *two and two abreast*; so great indeed must this be, and so much must the difficulty of *good driving* be aggravated, that it may be assumed it would be far better to keep this fourth pair of horses in attendance on the gun to admit of a used up pair being relieved, than to hook them in as part of the team.

In the above calculation no account is made of the *proportionately* enormous increase of expense in the Establishment of a Troop or Battery, an increase, which unless corresponding increased efficiency can be undeniably shewn, every true friend to the Service should zealously deprecate at present; this the Author of the "Military Notes" terms "the small increased expense of 1 driver and 2 horses per gun and waggon," vide page 1076 February No. of Records, in other words, in an Indian Light Field Battery it would be an addition of 12 men, drawing (if we allow on a moderate calculation 6 of them to be in receipt of Id. a day Good Conduct pay, and taking into consideration their rations below their actual cost at 6½ Rupees a man per month) more than 3000 Rupees a year, to which must be added, cost of yearly clothing and bedding, passage to and from India, and various Bounties, also an increase of saddlery and harness, and lastly 24 horses, adding in round numbers close upon one-fourth to the present expenditure on that head. I just here refer to a Field Battery only, if a Troop of Horse Artillery be

similarly increased, the expense would be still positively greater, though it would not be *relatively* to that now obtaining so great in proportion as in the Field Battery.

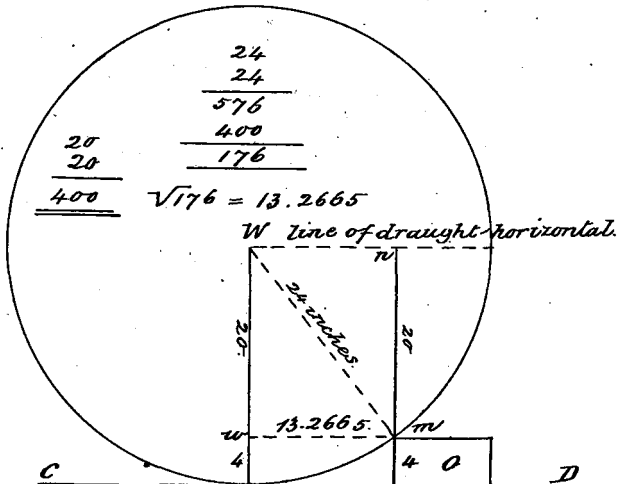
I have the honor to be Sir

Your Obedient Servant

G. CARLETON, Captain,  
*Madras Artillery.*

**Method of calculating the force necessary to draw wheel carriages over obstacles.**

Add the weight drawn to the weight of the whole carriage including wheels;— now in a two wheeled carriage each wheel supports half the load, and in a four wheeled carriage each wheel supports one fourth, at least for a practical calculation one may say so.



*The diameter of Wheel is 4 feet, radius: 2 feet or 24 inches.*

Let the obstacle *O* and wheel be as in the above diagram.

Let  $CD$  represent a horizontal road, and suppose the wheel with its weight to be 10 cwt. or 1120 lbs., the point  $m$  where wheel meets obstacle must be regarded as the fulcrum, and let  $W$  represent the whole weight at centre, which may be regarded as transferred to  $w$  in the same vertical line, then the power exerting itself in the line of draught will be to the weights as.

$$\begin{array}{r}
 13.2665 \quad : \quad 20 \\
 \therefore 20 \times P = W \times 13.2665 \\
 P = \frac{W \times 13.2665}{20} = \frac{1120 \times 13.2665}{20} = 742.924 \text{ lbs.}
 \end{array}$$

therefore it appears, that nearly 743 lbs acting in the line of action are necessary to draw a weight of half a ton over an obstacle 4 inches high on a horizontal road when the radius of the wheel is 24 inches or 4 feet in diameter, and with a wheel of five feet in diameter, as Artillery Light Field Carriage Wheels, the power necessary to overcome such an obstacle drawing such a weight would be very nearly 647 lbs. The above process is applicable to any other dimensions.

G. CARLETON, Captain,  
*Madras Artillery.*

**On Iron Shields for Ships of War &c. &c. by Lieutenant-Colonel  
T. Hay Campbell.**

In July 1861 I proposed a method of coating Ships of War with Iron in such a way as to gain greatly in strength and lightness over the plan then and still used, I submitted this to a distinguished Civil Engineer in England who is largely concerned in building Iron Ships and his opinion was, "that though my proposal presented difficulties both in construction and repair he did not say those difficulties could not be overcome and that he thought a Ship properly constructed upon my plan would be very strong and resist Shot probably better than any thing that had yet been devised." I then printed and distributed a short account of my Idea, and have now made several Plans explanatory of it, worked out so that experimental Shields can be built



therefrom or even the sides of a Ship, in as far as the Iron coating is concerned, I have also added in a practical form some ideas which suggested themselves to me while considering the subject.

I greatly hope the system I advocate may be tried, but even if it is not, I feel certain the bringing it forward will turn mens' minds from the way in which it is at present attempted to render Ships Shot proof, without making them too heavy for sailing, into a new and better channel. My principle is to employ alternate Layers of flat Iron and Wood bound firmly together, running either Horizontally or Vertically or both combined, but so placed that they present their edges to the outside and receive the blow from Shot upon them, basing the superiority claimed for my system chiefly on the rule, that the strength of Beams or Iron Plates to resist lateral pressure, is as the square of their depths multiplied by their thickness, though there are many other advantages belonging to it.

*Description of Plans representing Shields of Iron and Wood combined.*

No. 1. Is composed of Horizontal Iron Plates 8 inch Wide and 1 inch thick, with a layer of wood 2 inches thick between each Plate, thus alternating the layers of Iron and Wood.

Inside this mass there are Vertical Iron Plates 1 inch thick and 4 inches wide, placed flat against the edges of the Horizontal Iron and Wood layers, at intervals of 8 inches from Plate to Plate.—Those Plates are sunk into a mass of Wood Planking running Horizontally behind, each Plank being 9 inches deep and 5 inches wide.

In case of a Shield of this description being applied to a Ship, the Flat 4 inch Plates would be sunk vertically into the Ship's Planking.

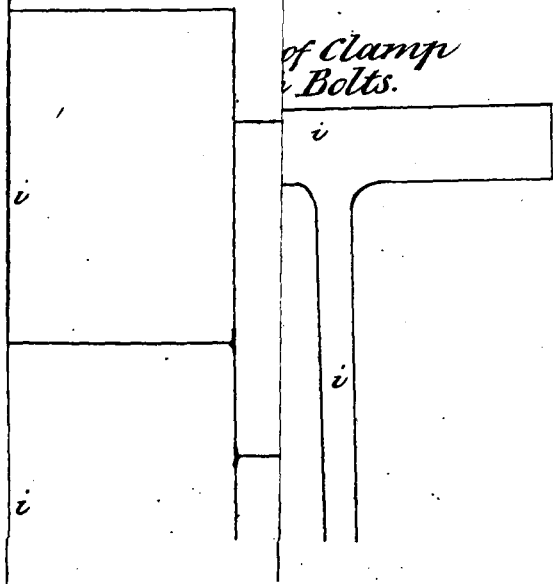
The Horizontal Layers are bound together by means of strong iron Clamps, which being drawn out into Square Bolts

*aneous.*

*ged by Lieu*

*Plate 13.*

*N<sup>o</sup> 1  
Shield.*



*of Clamp  
Bolts.*

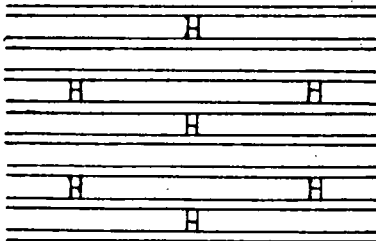
at each side, pass across the Horizontal Plates and through the Vertical Iron Plates and Wood Planks in rear, at the back of which they are rivetted.

Each Clamp incloses three Horizontal layers of Iron and two of Wood.

In case of the Shield being attached to a Ship's side, the Clamp Bolts would be secured in the Ship's Planking and Timbers.

As each Clamp presents a flat face towards the outside, one foot broad and 9 inches deep and the whole Clamps being fitted close together, the surface of the Shield is perfectly and equally covered with Plates of 1 inch Iron (that being the thickness of the Clamps) and those Plates each rest upon the edges of 3 Horizontal Iron Plates and 2 Wood Layers.

The Clamps are placed in echelon, with reference to each other, so that the Clamp Bolts are 2 feet separate from centre to centre Horizontally, and Vertically two Bolts come together and then a space of 7 inches is left, that is, the distance be-



tween the two Bolts of one Clamp ; and of the 3 Iron Plates and 2 Wood Layers, which one Clamp binds together, the Clamps contiguous includes 2 Iron Plates and one layer of Wood, along with one Iron Plate and

one Wood Layer above or below ; thus the whole are firmly bound in one mass.

All the horizontal Iron Plates run the whole length of Shield, without a break or perforation, and one layer of wood in three the same, the other Layers of wood are divided into lengths of 23 inches by the Clamp Bolts.

This construction gives a proportionate power of resistance to lateral strain as follows.

Take a section of Shield covered by one Clamp (vizt. a section of 9 Inches) and we have, Three Horizontal Iron Plates, each 8 by 1 inch with 9 inches of one inch Flat Clamp Plate resting upon them, so calculating the depth of each of the three Horizontal Plates at 9 inches, we get

$$9^2 \times 3 = 243.$$

as compared with a similar section of Solid Plate 5 inches thick, which gives

$$5^2 \times 9 = 225$$

While the section of Shield shows a surface of Iron compared with that of Solid Plate, as follows

$$9 \text{ Inches Section of Shield, } 8 \times 3 + 9 = 33$$

$$\text{Do. Do. 4 inch Plate, } 4 \times 9 = 36$$

$$\text{Do. Do. 5 Do., } 5 \times 9 = 45$$

giving a proportionate strength in Shield of more than 5 Inch Plate, with a smaller sectional surface of Iron than 4 Inch Plate.

For the sake of simplicity I have not included the Vertical Flat Bars of Shield either in calculating strength or surface. The Bolts are also left out as they would probably be the same or nearly so in this Shield and in Flat Heavy Plates. The Wood Planks are also left out in calculating both strength and weight, because in case of a Ship being built on this principle, the Iron would be worked into the Ship's side and thus the Wood Planking be no addition to the ordinary wood work.

If horizontal Iron Plates of 10 Inches by 1 are used with intervals and Clamps as before we have a strength of

$$11^2 \times 3 = 363$$

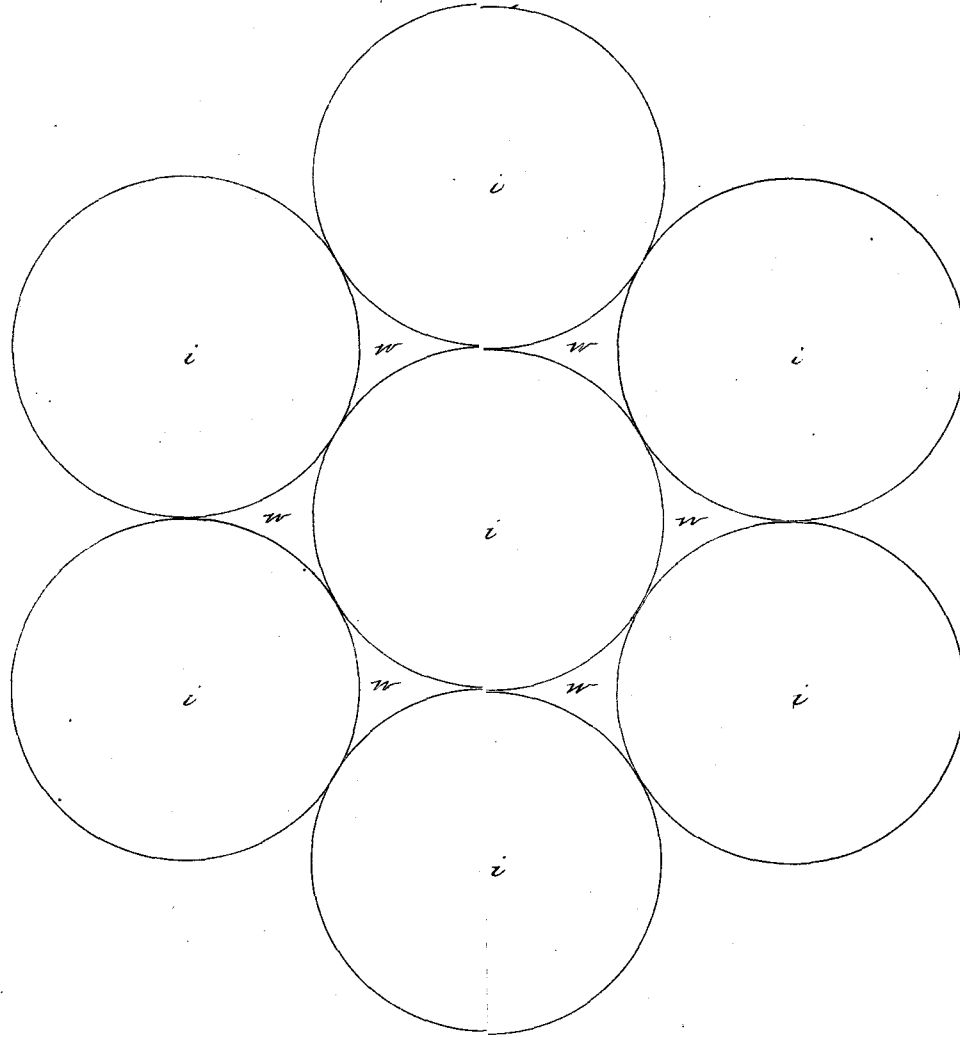
as compared with 9 inches of 6 inch Plate

$$6^2 \times 9 = 324$$

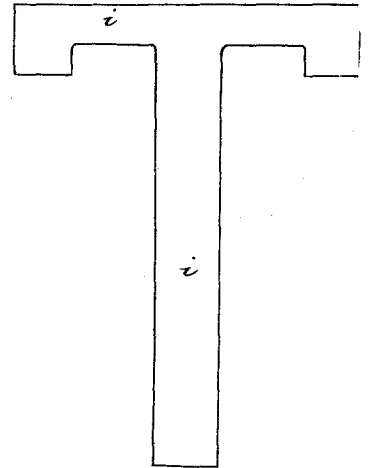
Iron Shields for Ships of War &c, by Lieut<sup>t</sup>. Col<sup>l</sup>. T.H. Campbell.

Plan N<sup>o</sup> 2.

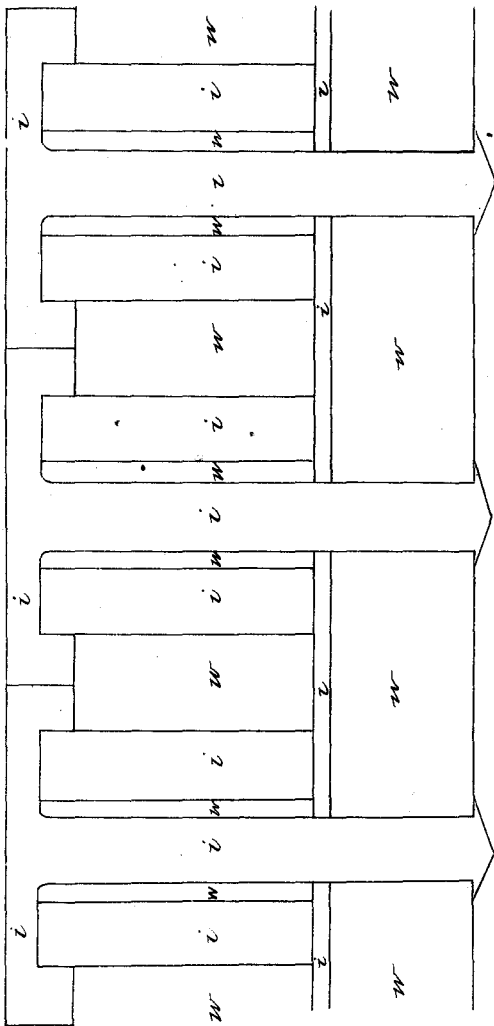
Front of Shield.



Bolt with Clamp Head.



Vertical Section of Shield.



Inch 12



3 Feet

The sectional surface of Shield being  
 $10 \times 3 + 9 = 39$   
 as compared with 4 and  $4\frac{1}{2}$  inch Plate

$$4 \times 9 = 36$$

$$4\frac{1}{2} \times 9 = 40\frac{1}{2}$$

That is, a sectional surface of Shield less than  $4\frac{1}{2}$  inch Iron Plate gives a greater resisting power than 6 Inch Plate.

No. 2. Is a construction similar to No. 1, only the Horizontal Plates are 2 inch thick and 8 inches broad, with 3 inch Wood Planks between, and instead of flat Clamps, Bolts with large flat heads are screwed through the Wood Layers into the rear Wood-work of Shield or the Planking of a Ship, the Bolt Heads are formed so as to act as Clamps, each binding together 2 Iron Plates and one Layer of Wood.

Behind the Horizontal Layers and placed flat against their edges, are Vertical Iron Plates  $\frac{1}{2}$  inch thick and 4 inches wide, at intervals of 4 inches from each other, sunk into a mass of Horizontal Planking which forms the back of Shield, the Planks being 10 inches deep and 5 wide.

The Bolts are merely experimental and suggestive; and the Flat Clamps as in No. 1 might be applied as already described, but the Bolts offer great facility in construction and repair, should they be found to answer otherwise. The proportionate strength of No. 2, may be taken as follows, in a section of 10 inches (10 inches being the Diameter of a Bolt Head) and thickness of Head 1 inch.

$$9^2 \times 4 = 324$$

10 inches of solid Plates giving as follows

$$5 \text{ Inch Plate, } 5^2 \times 10 = 250$$

$$6 \text{ Inch Plate, } 6^2 \times 10 = 360$$

Surface of iron in section of Shield being

$$8 \times 4 + 10 = 42$$

and of Solid Plates as follows

$$4 \text{ Inch Plate, } 4 \times 10 = 40$$

$$4\frac{1}{2} \text{ Inch Plate, } 4\frac{1}{2} \times 10 = 45$$

If Plates of 9 by 2 inches are used with intervals and Bolts or Clamps as before, we have as strength,

$$10^2 \times 4 = 400$$

$$\text{and 6 Inch Plate, } 6^2 \times 10 = 360$$

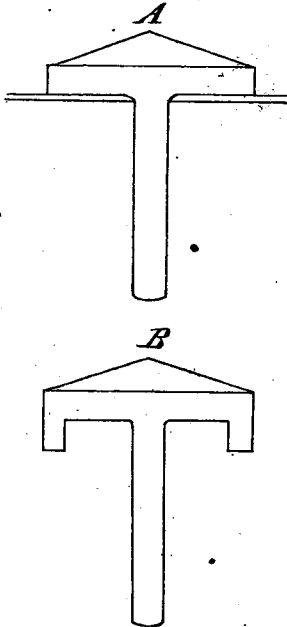
With sectional surface as follows

$$\text{Shield, } 9 \times 4 + 10 = 46$$

$$4\frac{1}{2} \text{ inch Plate, } 4\frac{1}{2} \times 10 = 45$$

That is, a sectional surface being little more than that of  $4\frac{1}{2}$  Inch Plates, gives a much greater strength than 6 inch Plates.

No. 3. Is a Shield composed of large headed Bolts, diamond shaped, screwed into a mass of Horizontal and Vertical Planking let into each other.



The Bolt Heads may be of two forms *A* or *B*, which latter is the one used in Plan.

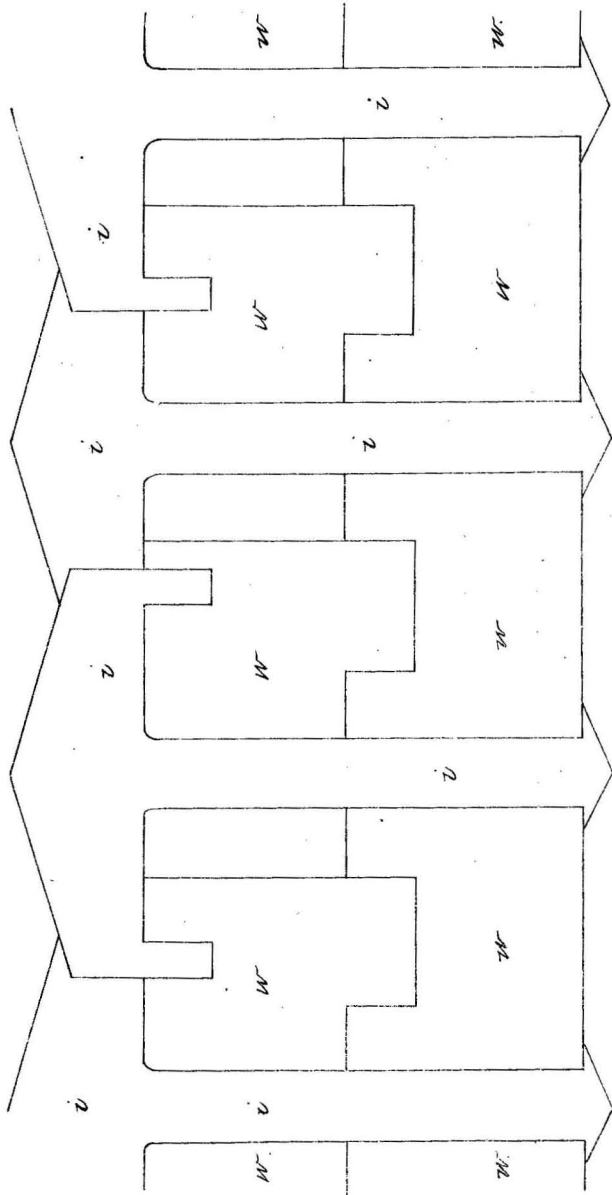
If *A*, is used, the Planking should be covered with a flat Plate of one inch Iron to give greater strength and prevent the Bolts being driven into the Wood.

It is difficult to calculate the resisting power of this construction, but it must be great, as the line of concussion would be indirect, owing to the diamond shape of the Bolt Heads, and consequently the pressure be partly forward and partly lateral, the

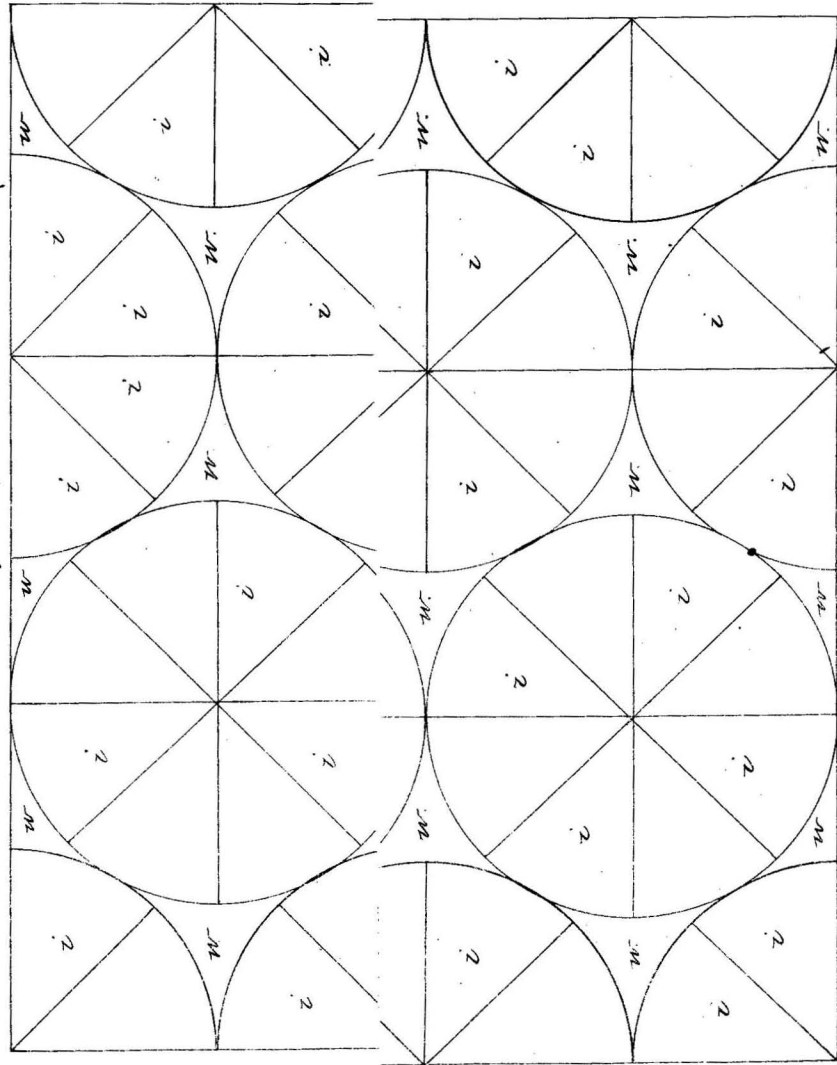
Iron Shields for Ships of War &c by Lieut<sup>th</sup> Col<sup>l</sup> T. H. Campbell.

Plan No 3.

Vertical Section of Shield.



Front of Shield.



M.B. i. denotes iron-work.  
w. wood-work.

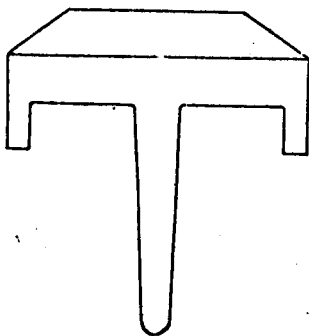




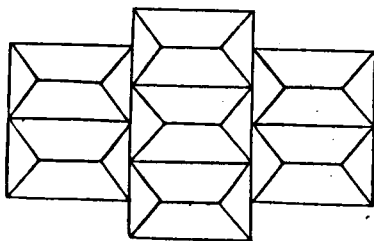
ridges upon the Bolt Heads should also have a tendency to split the shot and the sloping faces cause them to deflect.

The evident disadvantage is the risk of the Bolt Heads being broken off at the neck, though this I think may be prevented by placing them as in the Plan, where each one

• As in B. supports the other—I have\* there given a form to the Heads which must not only greatly increase their direct strength, but give an immense addition to their lateral power of resistance as compared with Bolt A, and it does not appear at all likely that those Heads would be knocked off.



*thus.*

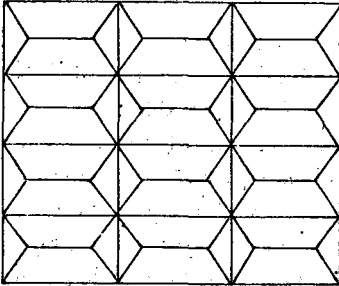


The facility for construction and repair in this Plan is so great and its lightness so evident that it seems well worthy of attention.

There is a point in this construction as well as in the others under consideration which ought to be kept in mind, vizt. all the parts are of comparatively small dimensions, and therefore capable of being made of material very superior to any that can be had in large masses of rolled Iron.

Instead of round Bolts, square or Oblong Plates might be used in form as per margin, with

*or thus.*



a strong spike in the centre, by means of which they could be fixed into the Ship's Planking, and those being placed close together the face of Shield would be of a tortoise form, this would be a very good form of Shield, it presents many advantages.

No. 4. Is a combination of Horizontal and Vertical Iron Plates.

The front portion is composed of Horizontal Iron Plates 6 by 1 inch, with Wood Planking 2 inches thick between each, behind this a Plate of Iron  $\frac{1}{2}$  inch thick resting flat against the edges of the Horizontal Layers, and in rear of this is a mass of Vertical Iron Plates 4 by 1 inch, edge on, let into Horizontal Wood Planking at 3 inches interval between each Plate, the Wood Planking being 10 inches wide and 9 inches deep.—The whole is secured together with Clamps as in No. 1, the Clamp Bolts running along the sides of the Horizontal Iron Plates, through the  $\frac{1}{2}$  inch flat Plate, between the Vertical Iron Plates and through the rear Wood Planking, at the back of which it is rivetted.

A section of this Shield contains a surface of Iron as follows.

Clamps.  $\frac{1}{2}$  Inch Plate.

$$\text{In one foot } 6 \times 4 + 4 \times 3 + 12 + 6 = 54$$

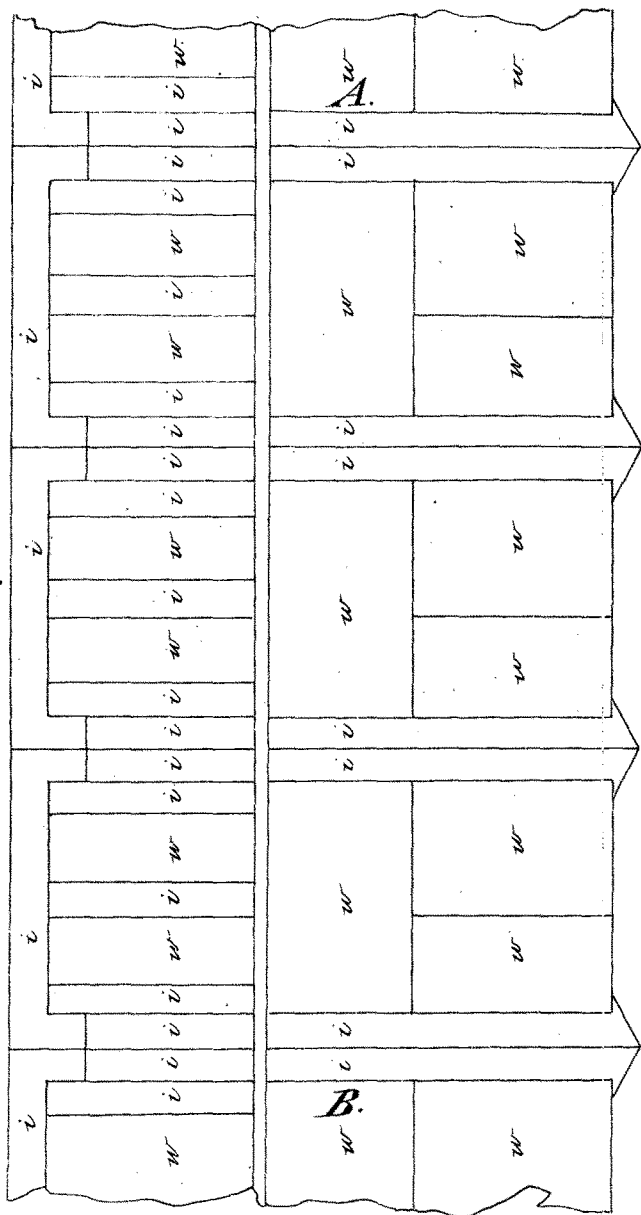
Do.

$$\text{at } 4\frac{1}{2} \text{ inch Plate } \dots\dots 4\frac{1}{2} \times 12 = 54$$

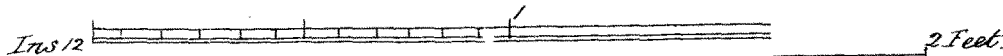
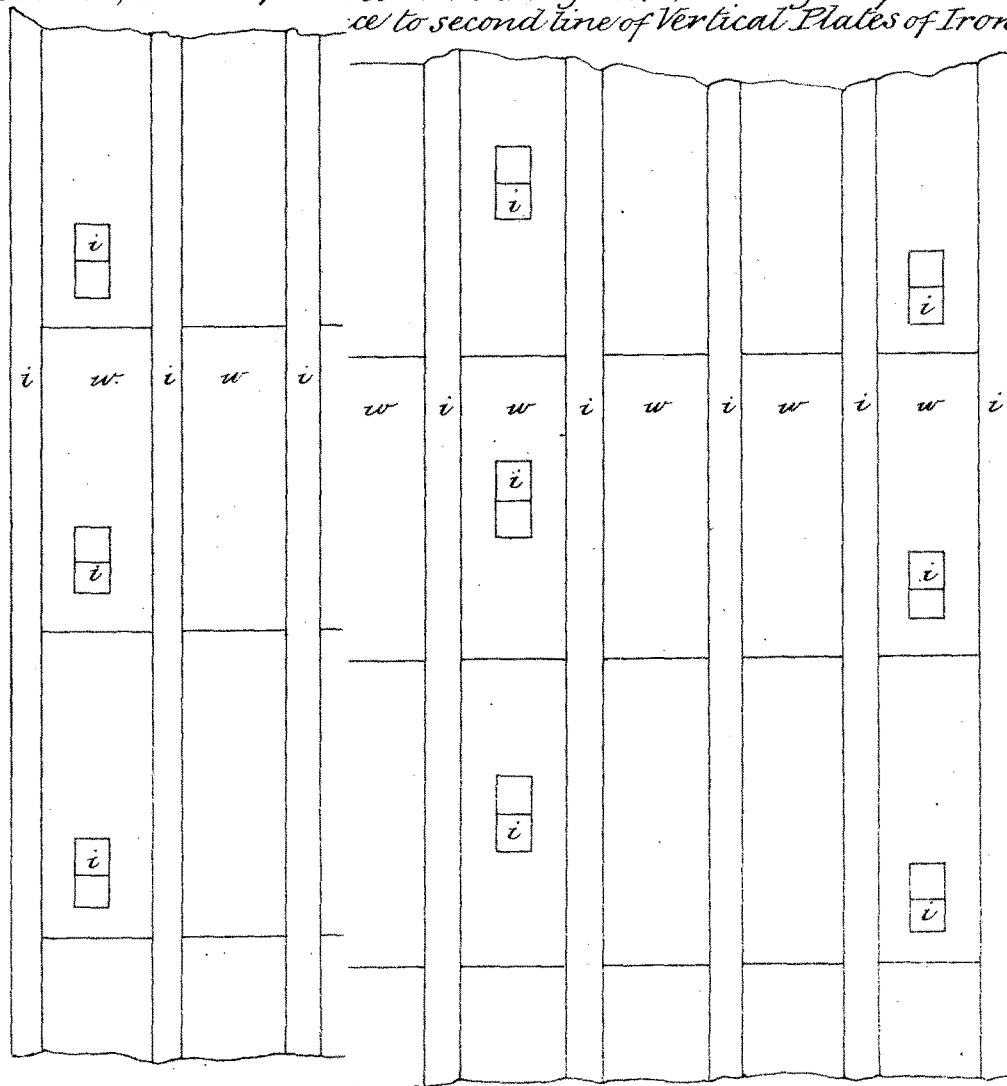
so that the weight of Iron is exactly the same as  $4\frac{1}{2}$  inch Plate.

Iron Shields for Ships of War &c by Lieu<sup>te</sup> Col<sup>l</sup> T. H. Campbell.  
Plan No 4.

Vertical Section of Shield.

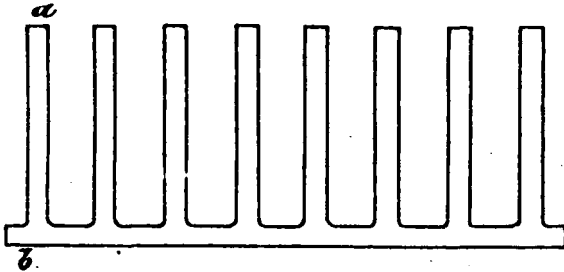


Vertical Diagonal Section through A.B. showing the position of Bolts, with reference to second line of Vertical Plates of Iron.



## REMARKS.

In making my Plans I have been guided in choice of materials by what I suppose to be easily obtainable, but there is a form of Iron that would make the construction of Ships of War, impregnable to every description of Projectile, a fact that no one could dispute, at the same time that their weight need not be greater than if covered with  $4\frac{1}{2}$  inch Plates, but I have not sufficient knowledge of the working of iron to judge whether this kind of Iron could be turned out, though I am inclined to think the great Iron Manufacturers in England would not fail in a matter of such importance, and if the Bessemer process of manufacturing Iron is in successful operation, the making of such Plates by means of it would probably be quite practicable, what I mean is Plate Iron of the following Section.



in length of not less than the height of side of Ship to be coated if the Plates are to be applied Vertically, or of 10 feet if Horizontally, the breadth should not be less than 2 feet and the thickness from *a* to *b* 10 inch.

The Section of one foot of this Plate contains exactly the same surface of Iron as 4 Inch solid Plate.

$$9 \times 4 + 12 = 48$$

$$4 \times 12 = 48$$

whereas the comparative strength on a very moderate computation is

one foot of proposed Plate,  $10^2 \times 4 = 400$   
 ,, of 4 inch Plate,  $4^2 \times 12 = 192$   
 ,, of 5 inch Plate,  $5^2 \times 12 = 300$   
 ,, of 6 inch Plate,  $6^2 \times 12 = 432$

or if we make the grooved Plate 11 inches from  $a$  to  $b$ , the section of one foot has a

surface of,  $10 \times 4 + 12 = 52$   
 and  $4\frac{1}{2}$  Inch Plate,  $4\frac{1}{2} \times 12 = 54$

while the strength is

Grooved Plate,  $11^2 \times 4 = 484$   
 6 inch Plate,  $6^2 \times 12 = 432$

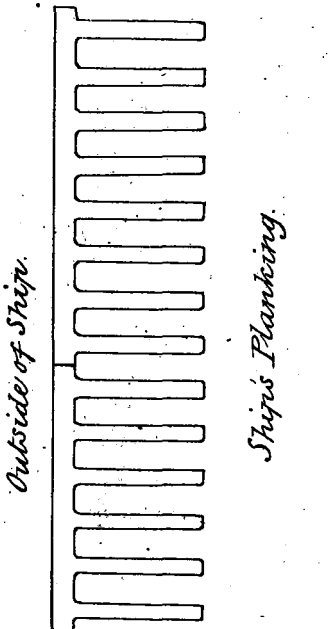
or in plain words, a sectional surface of Iron less than that of  $4\frac{1}{2}$  inch Plate gives a greater strength than 6 inch Plate.

If this kind of Plate can be turned out of good quality, I propose to sink it either Horizontally or Vertically into the Ship's Planking thus, with a Bolt here and there.

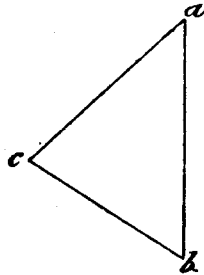
The Bolts need not be numerous or heavy, and I feel confident nothing could be driven through such a Ship's side.

In the numerous suggestions I have brought forward, it has been my object to prove that the mode of coating Ships with Iron hitherto tried is bad, and that such primitive make shifts should be

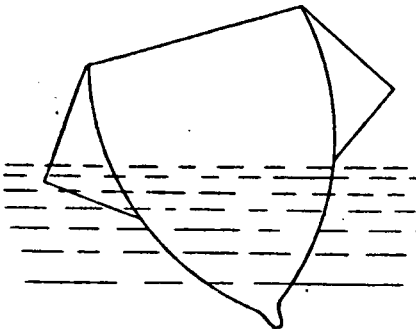
given up and something more reasonable tried, in this



latter class I do not include Mr. Jones' angulated Shield, the objections to which are numerous, the first being that to *reduce* weight he is forced to use a surface of Plate very considerably greater than on the Old Plan, for example in the following triangle, let *a. b.* represent the height of Ship's side to be covered with Iron and the two sides *c. a.* and *c. b.* Mr. Jones' angulated shield, I leave it to the advocates of the system to explain what great saving of weight is likely to result from the decrease of thickness of Plate,



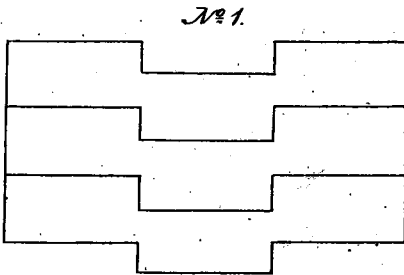
when 2 sides of the Triangle have to be covered instead of one. Another great objection is that Mr. Jones' Ships must always be quite straight in the water in order to obtain the advantages expected from them, for if they roll and a Shot strike his angulated Shield when off the level, the chance is it will



go through the Ship. Sir Howard Douglas has shewn many disadvantages in this system, and I think a few trials will prove its want of soundness.

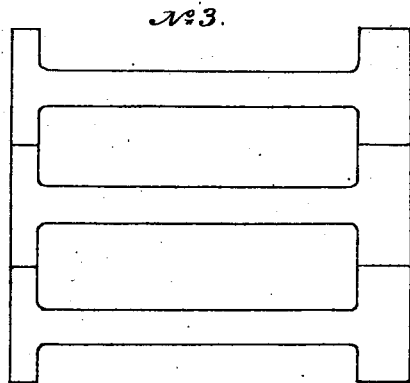
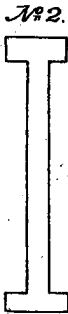
It is quite possible that the arguments I use against Mr. Jones' system have been already brought forward, indeed I hardly think they could have escaped notice, but at such a distance from the scene of argument I cannot know all that has been said or written on the subject.

I believe a Plan has lately been introduced to obtain width of Iron for facing embrasures &c., by means of layers of Iron one above the other, but in this the principle I have brought forward has been altogether overlooked, and I would strongly recommend a trial of it being made; as a greater depth of shield and much increase of strength would thus be obtained with a very reduced quantity of Iron, the system I allude to is that of placing Layers of Iron one above the other as in the following section, (1)

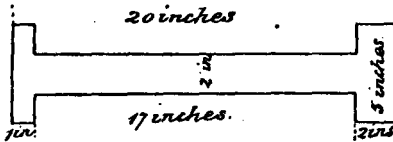


now instead of this I would use double T Iron of this sectional form (No. 2), and place Layers of it one above the other, with wood or stone or brick work between, as in the marginal section, (No. 3), of course the means used in one case to bind the Layers, together, would answer in

both, or something very similar.



The iron Plates should be in dimensions according to the following diagram,



and being placed one over the other a section of 15 inches would contain 3 layers of Iron and 3 of wood,

giving a surface of Iron of  $17 \times 6 + 15 \times 3 = 147$  inches, while the section of 15 inches of 10 inch Plates give  $15 \times 10 = 150$  inches.

The comparative strength being,

$$15 \text{ inch of T Iron, } 20^2 \times 6 = 2400$$

15 inch of 10 inch iron,  $10^2 \times 15 = 1500$ , or take one T Plate which in section gives  $17 \times 2 + 5 \times 3 = 49$ .

$$5 \text{ inch of 10 inch Plate giving } 5 \times 10 = 50.$$

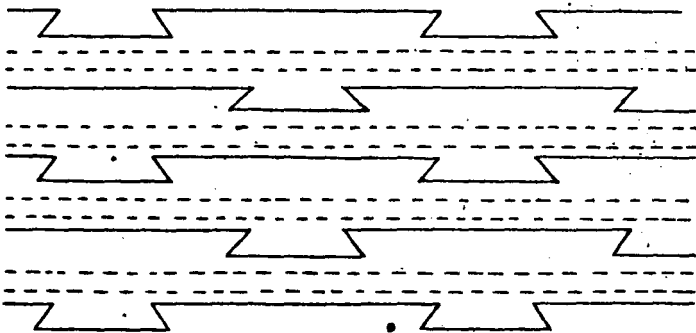
and the comparative strength is

$$\text{T Plate, } 20^2 \times 2 = 800.$$

$$10 \text{ inch Plate, } 10^2 \times 5 = 500.$$

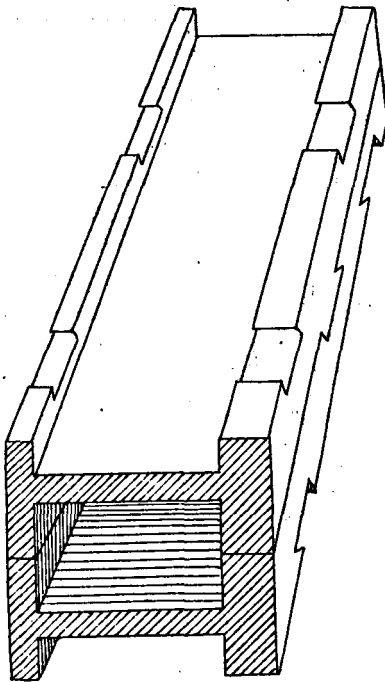
The Layers of iron might be dovetailed together as in the following Diagram which represents the face of a shield of this description.

The dotted lines show where the centre slabs of T. Plate come.

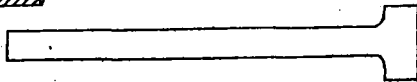




Below is a sketch shewing how the dovetails are cut and the Plates fitted.



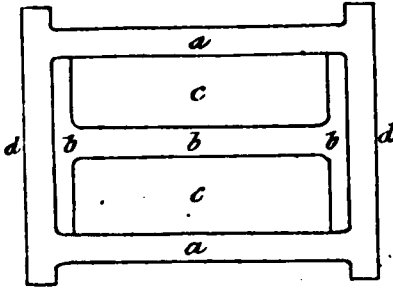
When double T Iron, dovetailed as above is used, it will be necessary to drive the intermediate Wood Blocks into their places endways, and this being done the whole mass of Plates will be firmly secured together and require few or no Bolts, but as this mode of inserting the intermediate Planks may prove troublesome, the Dovetailed Iron Planks can be made with the T only on the outside, thus,



and have a flat sheet of Iron placed between the Wall to be coated, and the edges of the Plates, to prevent the latter being driven into the former,

A vessel of immense strength and moderate weight might be built entirely of Dovetailed double T Iron. The Walls would be a compact Tubular mass of Iron, the hollows filled up with Blocks of Wood preventing the possibility of the Iron Plates getting displaced and obviating the necessity for

using Bolts or Clamps for that purpose. The Ribs & Beams should be constructed on the same principle, or, to give greater strength they might be made according to the following



section. The two outside pieces of T Iron *a. a.* are dovetailed together at *d. d.* as already described and a centre piece of double T Iron is driven between them endways as, *b. b. b.* leaving hollows at *c. c.* to be filled up with Blocks of Timber.

As it may in many cases be impossible to make the Beams in *one* length of double T Iron, it will be necessary after making the pieces of iron of convenient lengths to put them together so that the *ends* of portions of Top, Bottom and Centre pieces do not come near one another, on the contrary they must be equally distributed over the whole Beam, this being most essential to its proper construction.

BANGALORE, }  
16th April 1861. }

T. H. CAMPBELL.

#### The Monster American 15-Inch Cannon.

The new principle of casting large guns—hollow instead of solid—by means of a current of water introduced into the core which forms the mould of the bore, thus cooling from interior, has been successfully applied to the manufacture of a monster cannon at the Fort Pitt Foundry, Pittsburg, in the united States of America. It is found practically that guns of large calibre, cast by the ordinary solid method, have not the requisite strength to bear the strain in firing, owing to the fact that melted iron shrinks in cooling; the process of solidifying not being simultaneous throughout the mass, but progressive from the surface inwards. In consequence of the strong compression, formed on the outer and

first-cooled portions, it is obvious that, independently of flaws and cavities about the surface of the bore, where the greatest strength and hardness are required, the metal is there the least dense and the least hard of the whole mass; and it is mainly owing to this fact that guns become so soon unserviceable, by the enlargement of the bore round the seat of the ball, after prolonged firing. The state of compression on the outer crust of the gun assists the internal effort of the charge, and after a certain number of rounds with full charges, the gun bursts. The greater the mass of the casting, the greater the irregularities of structural arrangement, and the more unfit the gun becomes to resist the strain of explosion. Hence the hitherto practical limit to the calibre of cast-iron guns; no nation having yet succeeded in manufacturing safe and serviceable guns of more than 10 inches calibre.

By the new process of cooling internally, the metal about the bore is in a state of compression, and the exterior in a state of tension; which, in fact, is what it ought to be in order to obtain the greatest strength of the whole thickness of metal when subjected to internal strains. Moreover, the metal about the bore first cooled will be, as it should be, the hardest and densest. On the old system, on account of the inequalities produced in the physical structure of the metal, it is well known that, beyond a certain limit, little or no increase of strength is given to the gun by increasing its thickness of metal; and that, on this account, a practical limit has hitherto been placed to the manufacture of cannon of very large calibre; which would be found incapable of resisting the great strains to which rifled cannon are subject.

A new era in the casting of iron cannon has commenced; and we now proceed to describe the last great practical result of this new and highly ingenious process.

The monster gun, better perhaps known by the name of the 15 inch gun, has the following dimensions; its total

length is 15 feet 10 inches; greatest exterior diameter 4 feet across the breech, fining down to 25 inches at the muzzle. The thickness of metal behind the ellipsoidal chamber is 25 inches, and  $16\frac{1}{2}$  inches at the junction of the bore with the chamber, fining down to 5 inches at the muzzle. The weight of this enormous piece of ordnance is nearly 22 tons. The solid 68-pounder, the heaviest cast-iron gun of our own service, weighs about 4 tons 15 cwt.

The 15-inch gun is mounted at Fort Munroe upon an iron centre-pintle carriage, running up and recoiling in the usual manner; and fires shells of two classes. The first, to be used where the greatest possible explosive effect is wanted, of the minimum thickness ( $2\frac{1}{4}$  inches) admissible to endure the shock of the charge, is about 305 lbs. weight, containing about 18 lbs. of powder. The second, for battering purposes, has a wall of 5 inches thickness, and weighs 410 lbs. There is also a solid shot of the enormous weight of 425 lbs.; but for the reasons already mentioned connected with solid castings of large masses, it is very doubtful if it is practicable to cast a satisfactory solid shot of this diameter. The windage allowed is one-tenth of an inch.

Major Barnard, of the American Engineers, who has published a most interesting account of this cannon, gives us the following summary of the practice carried on with it in the experimental trials. In five trials, at 2000 yards, with 35 lbs. of powder, the lateral deviations were confined within 5 yards on either side of the target. The vertical deviations, probably due to varying initial velocities, or perhaps to some difference in the weight of the shells, ranged 17 yards each way short and over. With 40 lbs. of large-grained powder the initial velocity was found to be 1328 feet per second. The greatest range attained, with the maximum elevation of  $28^{\circ} 35'$ , was 5730 yards, with a time of flight of 27 seconds.

Such immense charges, however, produce far less strain on the gun than might be supposed, owing to the nature of the

powder used, and described in the official reports as "large-grained," and as "Rodman's perforated cake powder." The former is of 6-10ths inch cube in the size of its grains; the latter is compressed into solid cakes at a considerable pressure, and perforated with holes to admit access to the flame. The object intended by this improvement is to retard the burning (analogous to the plan adopted by Sir William Armstrong's slow burning powder,) and thus reduce the excessive strain to which all guns are subject with fine-grained powders, and which by the number of angles presented to the tongues of flame, are inflamed almost instantaneously, and before the heavy projectile is started from its seat. This result is estimated by a pressure gauge introduced into the chamber of the gun. The comparative initial pressure of the "perforated cake," "large grained," and common cannon powder, are estimated to have about the ratios of one seventh, one third, and unity: a result of very great importance in its bearing upon the practicability of using cast iron guns of extraordinary calibres.

It will be interesting at this point to notice the performances of the English monster gun, better known as the Horsefall gun, mounted near South sea Castle; Portsmouth; this being the largest piece of ordnance hitherto made in this country. The weight of this gun is about 22 tons, and it throws a solid shot of about 360 pounds weight. 130 rounds have been fired, with charges of 40 and 50 lbs. of powder; and with 18° of elevation a range of a little over 5000 yards was obtained. But that the cannon was unable to stand these proof charges, comparatively moderate for its calibre, was known to be strongly suspected by the Director-General of Artillery, and this opinion was confirmed by the discovery of a crack of over three inches in length in the chamber, when searched and examined lately by Captain Freeth, Assistant-Inspector of Artillery. It is probable that it will be again subjected to proof at an early date. The American 15 inch cannon had, up to the date of the latest reports, fired 350

rounds with full charges; and at the 300th round, when the last search was made, the most delicate tests applied to the bore failed to indicate the slightest enlargement or deterioration of any kind.

But the question has probably long ere this suggested itself to the minds of many of our readers, "Of what use are such extraordinary calibres? How are such gigantic cannon to be worked? Are not rifled guns destined to supersede all smooth-bored guns? And does not Sir Howard Douglas in his 'Naval Gunnery' express the conviction that such immense pieces of ordnance are quite inapplicable either for sea or land service?" We must postpone until our next issue, for want of space, the consideration of these questions, the more important as vitally bearing upon the extraordinary armaments with which the proposed forts on the Spit Shoals will eventually be manned.—*A. and N. Gazette.*

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**Revised Regulations for the painting and repair of Gun Carriages, Wagons and Carts, and for painting and lacquering Platforms, Shot, Shell and Shot Furnaces.**

*Circular No. 673.*

## HOME AND FOREIGN.

54 Artillery.  
5349.

WAR OFFICE, PALL MALL,  
5th April 1861.

The existing arrangements for the painting and repair of the gun carriages, wagons, and carts belonging to the Royal Artillery, and the wagons and carts of the Military Train, as well as for the painting and lacquering the various natures of ordnance and carriages in position together with the platforms, shot, shell and shot furnaces in charge of the Commanding Officer of the Royal Artillery, having been under consideration, Lord Herbert has decided, with the concur-

rence of his Royal Highness the General Commanding in Chief, that the following revised Regulations shall be observed in the performance of these duties in future :—

1. All gun-carriages, wagons, and carts in charge of the Horse and Field Brigades, Royal Artillery, and Military Train, are to be painted with one coat of paint and lettered annually.

This service is to be performed at home in the spring, and abroad *at the expiration of the summer season*, and, as a general rule, is to be executed by the wheelers of the battery or corps.

2. All guns, &c., forming the armament of fortresses and garrisons are to be lacquered and painted biennially, but should it be found on inspection that guns, &c., mounted on the seaface of works are in a bad state from exposure to the spray of the sea, they should be lacquered and painted every year, instead of once in two years, as at present. On this point, considered as a question of expense, a sound discretion is to be exercised.

3. The painting and repairing the garrison gun-carriages in charge of the Royal Artillery, and the lacquering and anti-corrosioning the ordnance, shot, shell, &c, is to be performed under the orders of the Commanding Officer of Artillery, instead of by the Military Storekeeper as heretofore.

4. Whenever it may be deemed of sufficient importance that guns and carriages, from their prominent positions, should be rendered less conspicuous to an enemy or to protect the wood work of the carriages from the sun, Commanding Officers of Artillery are authorized to demand green or stone colour paint resembling the face of the work, as may be most suitable for the purpose of their respective stations, reporting at the same time the reasons which render such colours preferable. In the absence of any special application to the contrary, the ordinary colour will be supplied,

5. The work connected with garrison guns should, as far as possible, be performed by the artificers of the garrison batteries, assisted by competent gunners, and the work superintended by an intelligent non-commissioned officer. Working pay will be allowed according to the Queen's Regulations, page 283, to the non-commissioned officers, artificers and gunners employed on this service.

6. The Pay Lists will be drawn up and certified as prescribed by Horse Guards' Circular of the 11th August 1859, Working Pay  
I (1859) and War Office Circular No. 475.

7. In the case of the Horse and Field Brigades, Royal Artillery, and Battalions of the Military Train, whenever it may be found absolutely necessary to employ other soldiers or workmen, whether for services to field or garrison guns, &c, in addition to the paid artificers of the corps (which would involve a claim for working pay,) a special representation of the circumstances which render such employment indispensable is to be made, before any such expense is incurred, *if at home*, to the Adjutant General, who will, *if it is absolutely necessary to incur the expense of Working Pay*, transmit it to the Under Secretary of State for War; and *if abroad*, to the General Officer commanding the troops, for authority to incur the expense.

8. The Military Storekeepers will provide in their *estimates* for such *labour* as may probably be required, and in their *annual demands* for the *materials* required in repairing, painting, coating, lacquering, and anti-corrosioning of all guns field and garrison, mounted and dismounted, with their carriages, wagons, carts, platforms, and appurtenances, shot furnaces, shot and shell.

9. To enable the Military Storekeeper at each station to frame his estimate for labour, and regulate his demand for material, the Officers commanding the Royal Artillery in the District and Battalions of Military Train will furnish him



annually not later than the *first week in September*, with a *Statement of the quantities of the different material they will require, together with a Return of the numbers and nature of the Guns, Carriages, Platforms, Shot, Shell, &c., in their respective charge, which will require painting, lacquering, &c., in the following financial year.*

10. At *home stations* the Commanding Officers of Artillery will forward their *Demands* for such materials as will be required, accompanied by a *statement* of the stores to be painted or lacquered &c., to the Deputy Adjutant General of Artillery at the Horse Guards in the month of *December*, for transmission before the *31st March*, to the Secretary of State for War, who will then give the necessary instructions to the Military Storekeepers of the respective districts for the issue.

11. In like manner, and at the same periods, the Officers commanding Battalions or Detachments of the Military Train will send their *Demands* and Statements direct to the Colonel Commanding the Corps for transmission to the War Office.

12. At *foreign stations* the Officers Commanding will make their demands upon the Military Storekeeper under the authority of the General Officer Commanding.

13. The rules regarding the painting and lacquering, &c. of the guns, carriages, platforms, shot and shell &c., in charge of Military Storekeepers, will remain as at present prescribed in the Home Regulations (Ordnance 1855.)

14. Except under very peculiar circumstances which should be reported, the Royal Engineer Department will cease to perform this duty.

15. In order to enable the Commanding Officers and Military Storekeepers to calculate the quantities of material to be demanded annually and provided in the estimates, six statements of the proportions of paint, putty, brushes, tools, &c., are *annexed* for their information and guidance.

The foregoing Regulations are substituted for those un-  
dermentioned.

*General Orders.*

*Home Regulations.*

10th March 1851.	$\frac{C}{823}$	} Article No. 575, page 145.
10th Novr. 1851.	$\frac{E}{1549}$	
23rd Aug. 1852.	$\frac{C}{3624}$	
14th Novr. 1825.	—	} No. 579, page 146.
9th Novr. 1829.	$\frac{A}{1673}$	

*Circular Orders.*

No. 276	} 26th June 1858	54
No. 277		<u>Artillery</u>
No. 522	} 24th Sept. 1858	54
No. 323		<u>Military Train</u>
No. 537	20th Jany. 1860	54
		<u>Artillery</u>
		4326

Also,

Para 19 of the Royal Artillery General Regimental Or-  
ders, No. 410, dated Horse Guards, 28th September 1859.

B. HAWES.

No. 1.—*STATEMENT* shewing the proportion of the ingredients  
required for making 84 lbs. of Anticorrosion, for coating the  
*EXTERIOR OF GUNS*, Circular No. dated

Anticorrosion dry.....	40 lbs.
• Black, Grants' ground.....	4 „
Lead, Red, dry.....	3 „
Oil, Linseed, raw.....	4 gallons.
Turpentine.....	1 pint.

Proportion for 112 lbs of lacquer, for the bores of guns.

Lead, Black .....	24 lbs. 8 ozs.
Lead, Red .....	6 „ 12 „
Lamp, Black.....	12 „
Oil, Linseed, raw.....	9 gallons.

The brushes required for painting guns with two coats will be the following:—

- For the outside of every 1 to 90 guns, brushes, 000... 1
- For the inside of every 1 to 390 „ „ „ ... 1
- For the bottoms of the bores of every 1 to 1000 guns, brushes 000..... 1

Nature of Guns.	Required to coat the outside of 10 Guns with two coats with either.			For the bores : two coats.		
	Anticorrosion, ground.	Green.	Grey, or Stone Colour.	Lacquer, Black Lead.		
	lbs.	lbs.	lbs.	lbs.		
10 inch.....	30	34	45	5½		
8 „ .....	25	28	40	5		
68 pounder.....	30	34	45	5		
56 „ .....	30	34	45	5		
42 „ .....	27	31	42	5		
32 „ .....	20	22½	30	4½		
24 „ .....	18	20	27	4		
18 „ .....	17	19	25½	4		
12 „ .....	16	18	24	2½		
9 „ .....	12	13½	18	2		
6 „ .....	10	11	15	1½		
Mortars.	13 inch.. {	Sea Service...	20	22½	30	} 2
		Land Service..	14	15½	20	
	10 inch.. {	Sea Service...	16	18	24	} 1½
		Land Service..	12	10½	14	
8 inch .....	6	6½	8	8		

The quantities given above are in every case the *maximum* required.

N. B. The ingredients for making anticorrosion will be supplied separately, to be mixed when required for use. The green paint and stone colour paint will be supplied in their prepared state, and issued fit for use.



- Kettles, paint, to hold about 12 lbs..... 2
- Cans, oil containing... { Oil Linseed, Boiled...  $\frac{1}{2}$  }  
 { pints. } Raw .....  $\frac{1}{2}$  } ... 1  
 { Turpentine, gills..... 1 }
- Knives, stopping.... 2

**IRON GARRISON CARRIAGES.**—Two Coats of anticorrosion or Paint, mixed for use.

	Anticorrosion, Two Coats, lbs.	Stone Colour, Two Coats, lbs.	Green.		Remarks.
			1st Coat Lead Colour, lbs.	2nd or Top Coat Green, lbs.	
32 Pdr....	4 $\frac{1}{2}$	4	2 $\frac{1}{2}$	2	Home Stations Biennially.
24 " ....	4	4	2 $\frac{1}{2}$	2	
18 " ....	3 $\frac{1}{2}$	3 $\frac{1}{2}$	2	1 $\frac{1}{2}$	
12 " ....	3	3 $\frac{1}{2}$	2	1 $\frac{1}{2}$	
9 " ....	2 $\frac{1}{2}$	3	1 $\frac{1}{2}$	1 $\frac{1}{2}$	Foreign Stations Annually.
6 " ....	2	3	1 $\frac{1}{2}$	1 $\frac{1}{2}$	

If the ingredients for making the anticorrosion are required, the proportion is given in Statement No. 1, for coating the exterior of guns.

For 10 or more iron garrison carriages :—

- Brushes, ground, hair, 000 ..... 4
- Kettles, to hold about 12 lbs..... 2

For less than 10 half the proportion.

- Anticorrosion for 4 cast-iron trucks, when the carriages are "common, standing,"..... 2 lbs.
- Brushes.. { ground, hair. 000..... 1  
 { Tool, No. 6 size..... 1
- Kettles, Paint..... 1

The demand should specify the particular colours that may be required, corresponding with the works.

No. 3.—STATEMENT, showing the proportions of Paint, &c. to be demanded annually for GUN CARRIAGES and WAGONS, Batteries of Horse and Field Brigades Royal Artillery, Circular, No. dated

		War Establishment.		Peace Establishment.	
		Horse Battery.	Field Battery.	Horse Battery.	Field Battery.
		lbs.	lbs.	lbs.	lbs.
For a 9 pounder Battery.	Paint, Zinc.....	165½	160½	121	116
	Composition for Canvas work...	14½	14½	12½	12½
	Putty.....	24	22½	17½	15½
For a 6 pounder Battery.	Paint, Zinc.....	142	138	114	110
	Composition for Canvas work...	14½	14½	12½	12½
	Putty.....	20	19	15½	14½
For a 12 pounder Armstrong Gun Battery.	Paint, Zinc.....	235	235	133	133
	Composition for Canvas work...	20	20	12	12
	Putty.....	35	35	17	17
For an 18 pounder Battery in position.	Paint, Zinc.....	...	360	...	231
	Composition.....	...	46	...	34
	Putty.....	...	40	...	26

The following is the number of Carriages belonging to Horse and Field Batteries, for which the above proportions of Paint, &c. are to be provided.

	War Establishment.		Peace Establishment.	
	Horse Battery.	Field Battery.	Horse Battery.	Field Battery.
9 pounder Battery.....	25	24	18	17
6 pounder Battery.....	23	22	18	17
12 pounder, Armstrong Battery..	30	30	17	17
18 pounder Battery in Position...	...	25	...	16



Description of Articles.	Paint ready for use.	Putty.	Composition.	Remarks.	
	lbs.				lbs.
One Carriage with wheels &c. complete.	8 and 10 in. howr. bracket	10½	1½	.....	3½ for gun cover.
	8 inch 52 C. guns.....	9½	1½	.....	
	32 " 50 C. " .....	8½	1½	.....	
	24 " 50 C. " .....	9	1½	.....	
	18 pounder in position....	8½	1½	.....	
	10 inch mortar.....	4½	0½	.....	
One Limber with wheels &c. complete.	8 and 10 in. howitzer....	7½	1	.....	1 for cartouches.
	8 inch 52 C. gun.....	6½	1	.....	
	32 pounder 50 " .....	5½	0½	.....	
	24 " " " .....	5½	0½	.....	
	18 " " in position....	8½	1½	.....	
	8 and 10 inch mortar....	3½	6 oz.	.....	
Small Arm Wagon and Limber complete.	4½	1½	.....		

Description.	Paint.	Oil, Raw, Linseed.	Oil, Boiled, Linseed.	Turpentine.	Varnish Copal.
	ozs.	pint.	pint.	pint.	pint.
For writing a Battery of any Description. White.....	4	...	...	...	...
For writing Tube and Fuze Tins for a 12 pounder Armstrong Battery. Vermillion.....	6	...	...	...	...
For thinning Paint sent to a Battery in case it should get thick....	...	1	1	½	...
For varnishing Points of Axletrees, Linch pins, Washers, and Points of Shafts, when not in actual service to prevent rust.....	...	...	...	...	½



No. 5.—*STATEMENT* showing the proportions of Paint &c. to be demanded annually, *MILITARY TRAIN, Circular*.  
No. dated

For every	Colour.	Putty.	Composition for Canvas covers.
	lbs.	lbs.	lbs.
Ambulance Wagon, complete.....	6	2	7
Small-arm Ammunition Wagon with Boxes, Limber &c. complete.....	4½	1½	...
Forage or General Service, pattern Wagon, complete.....	5	2	6
Forage Cart, Maltese pattern, with Boxes, Bel-lows, &c., complete.....	3½	1	4

Proportion of one set of Brushes, Tools &c., each *Artificer* to have a set.

Brushes to last 3 years.	}	Duster, 000.....	1	}	Kettles, Paint.....	2	
		Ground for Paint, 000.....	1		Writing Pot.....	1	
		Tools.	{ No. 6 size.....		1	Palette Knife.....	1
			{ No. 2 size.....		2	Putty do. ....	1
		Pencils, Camel's hair.....	2				

No. 6.—*STATEMENT* showing the proportions of ingredients used for making Paint for the various natures of *SHOT, SHELL, and SHOT FURNACES*, and also the quantity of mixed paint required for the same, *Circular, No.* dated

Ingredients used.	To make 150 lbs. of Black paint for Shells, Grape and solid Shot, under 68 pdrs.			To make 84 lbs. of Red paint for 68 pounder Shot.			To make 90 lbs. of Red paint for case shot.		
	lbs.	ozs.	drs.	lbs.	ozs.	drs.	lbs.	ozs.	drs.
Black, Grant's, lbs. ozs. drs.....	50	0	0	20	0	0	25	0	0
Oil Linseed, gallons, quarts, pints. {	Boiled..	7	2	0	2	0	2	0	2
	Raw....	2	0	0	1	0	1	0	0
Lead, Red, lbs. ozs. drs.....	5	0	0	25	0	0	25	0	0
Litharge.....	7	0	0	7	0	0	7	0	0
Turpentine, Spirits, gallons, quarts, pints.....	0	2	0	0	0	0	0	0	3
Brown, Spanish, lbs. ozs. drs.....				25	0	0	25	0	0

III.

Shot and Shell.	For twice painting 100 shells or Round shot.		For twice painting 100 Grape shot.		For twice painting 100 Case shot.	
	lbs.	oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.
13 inch.....	14	0	...	...	...	...
10 ".....	10	0	36	0	36	0
8 " or 68 pounder.....	8	0	18	0	20	0
56 pounder.....	6	8	16	0	20	0
42 ".....	6	0	14	0	18	0
32 ".....	5	0	10	0	16	0
24 ".....	4	8	9	0	15	0
18 ".....	4	0	8	0	14	0
12 ".....	2	8	7	0	12	0
9 ".....	2	0	5	0	10	0
6 ".....	1	8	4	0	8	0
3 ".....	1	0	2	8	...	...

Shot Furnaces.	Two Coats.	
	lbs.	oz.
1 Shot Furnace.....	4	8

Forms of Proof Reports of Gunpowder, forwarded to the Superintendent of Royal Gunpowder Factories.

Circular No. 674.

HOME AND FOREIGN.

74  
 2  
 595

WAR OFFICE,  
 PALL MALL, S. W.

5th. April 1861.

1. The Secretary of State for War considering it desirable to establish a greater uniformity in the Proof Reports Gun-

powder forwarded to the Superintendent of Royal Gunpowder Factories, at Waltham Abbey, from the several stations at home and abroad, as well as to render the Proof results a more certain criterion of the general state of Powder in charge, has been pleased, with the concurrence of His Royal Highness the General Commanding-in-Chief, to approve of the annexed Forms, W. O. No. 1517, and W. O. No. 1518, being used by the Inspector of Warlike Stores and other Proof Officers, in lieu of the various Forms, which have hitherto been furnished.

2. Form No. 1517 is to be filled in by the Military Storekeeper and Inspector of Warlike Stores as far as practicable, when the directions in Circular No. 541, for the arrangement of the Store, have been carried into effect, and sent to the Superintendent, Royal Gunpowder Factory, Waltham Abbey, who will cause the original Proof of other several lots at Purfleet to be traced and inserted. The Form will then be returned to the respective stations for the information of the Storekeeper and Proof Officer, and will constitute the basis of a record of the Powder in charge; and the subsequent Proofs at the Stations as they take place being inserted, the state of the Powder in Store will always be known.

3. In order that this record of the Powder in charge may be kept up at the several Stations, the Storekeeper at Purfleet will in future send with the delivery voucher a memorandum of the Purfleet Proof of the lot or lots issued, and this information should be recorded at once on the receipt of the Powder.

4. Form No. 1518 is the report of Proof to be forwarded annually to the Superintendent of Royal Gunpowder Factories, Waltham Abbey.

5. When the Store of Powder has been properly arranged as directed by Circular No. 541 and the Form No. 1517 completed, the following mode of Proceeding with the

periodical Proof will probably be found convenient, and sufficient to secure an accurate knowledge of the condition of all the Powder in charge.

6. Ten barrels of Powder may be selected indiscriminately from each of the different lots, which together constitute about *one-third* part of the whole quantity in Store, when samples taken from each and mixed together will form the sample to be fired the *first* year. In the *second* year the same course may be pursued by testing samples from other barrels taken out of the lots composing *one-third* part more of the total Store; and the remaining third portion would undergo Proof in like manner in the *third* year.

7. In the succeeding year the time will have again come round for proving those lots of Powder which underwent the test in the first year, and so on.

8. The barrels from whence the samples are drawn should in each case be marked with the date of Proof, and other barrels taken when the same lot is again proved.

9. The Inspector of Warlike Stores or other Proof Officer will, however carry, on the Proof by sight and hand as much further as he may think necessary, and even resort to Proof firing should it be desirable from the Magazines being damp or defective, or the condition of the Powder doubtful from any other cause, since it is to be clearly understood that these general arrangements are not intended to relieve Inspectors of Warlike Stores, or others upon whom the duty may devolve, from the responsibility of satisfying themselves that the Powder at their respective Stations is always in good condition.

B. HAWES.

To Military Storekeepers,  
Inspector of Warlike Stores &c.



IN STORE AT

115

W. O. FORM, 1517.

		Number of Lot.	
		Sort of Grain.	
		Number of Barrels.	
		lbs. of Powder in each Barrel.	
		When received at this Station.	
	Placed in	Magazine.	
		Bay.	
	Shifted to.	Magazine.	
		Bay.	
		Magazine.	
		Bay.	
	Issued.	Magazine.	
		Bay.	
	Date		
	To.		
		Quantity—lbs.	

## A REPORT OF THE PROOF OF GUNPOWDER

Description.			Sort of Grain.	Date of Receipt at the station.	Number of Bar- rels in Lot.
Maker's Name.	Date,	No. of Lot.			





**Breaks or Friction chocks for Garrison Gun Carriages, proposed by Mr. John Allen, Master Artificer Military Store Department Malta, 1859.**

**CIRCULAR MEMORANDUM.**

**Addressed to Officers in Command of Royal Artillery and Royal Engineers**

**HORSE GUARDS. S. W.,**  
*20th April 1861.*

The annexed Memorandum of the Ordnance Select Committee, on Allen's Breaks for Gun Carriages, is promulgated for general information and guidance, and Officers Commanding Royal Artillery will forward demands in the usual manner for Breaks for those Carriages whose recoil is excessive.

By Command of His Royal Highness  
 The Duke of Cambridge,

**JAMES YORKE SCARLETT,**

*Adjutant General.*

*Breaks or Friction Chocks for Garrison Gun Carriages, proposed by Mr. John Allen, Master Artificer, Military Store Department, Malta, 1859.*

1st. Allen's Break consists of a wooden scotch or wedge, shod with iron which is permanently connected with the axle-tree arm and bracket of the carriage, in such a manner as to receive the truck on the discharge of the Gun, lift it clear of the platform and carry it during the recoil.

When the Gun is run forward, the trucks slip off the breaks, which have a little movement on a joint B, and bear on the platform again, while the breaks follow them, and do not in any way impede the running up.

2nd. These breaks have been found by experiment to reduce the recoil, on a dry wooden platform at least one half; thus the mean recoil of an experimental rifled 32-pounder, on a

rear chock carriage fitted with them, was 3 feet 4 inches,—without them, it was 8 feet 5 inches.

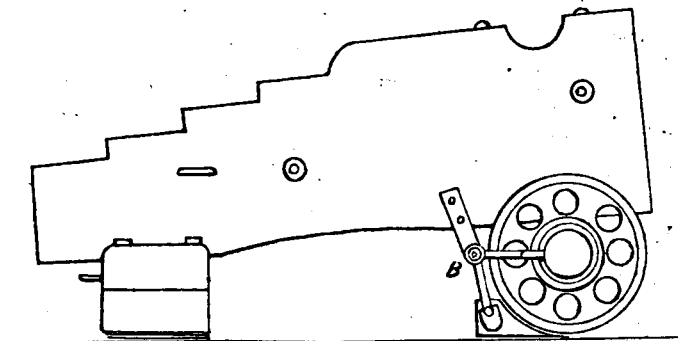
The mean recoil of a 68-pounder of 95 cwt., mounted for the purpose of experiment on a rear chock carriage on a stone platform, slope  $\frac{1}{4}$ th., varied from 6 feet to 10 feet with the break, and averaged 7 feet 7 inches—without the break it was 17 feet. So far, therefore, as the recoil is concerned, Allen's breaks would render it feasible to mount 68-pdr. guns on ground platforms, but the great weight of the gun and carriage viz., 110½ cwt., makes it inexpedient to do so, as the Committee have shewn in their Report, No. 1404, on the breaching experiment at Bexhill.

3rd. The Committee reported 10th. July 1860, their opinion that these breaks may be applied with advantage to Gun carriages on ground platforms, whether common garrison, or rear chock; in many situations where the recoil on the present carriages is found to be excessive or, on ramparts too narrow to allow of platforms of full length for modern ordnance, such as exist in several works of old construction.

4th. The cost per carriage is about £4-14s.

The annexed diagram shews the construction and application.

Demands should specify precisely the nature of the carriage to which it is proposed to apply the breaks—the diameter of the axletree arm—and the diameter of the trucks.



Fitted with Mr. Allen's proposed Break, 1859.

The Truck is shewn on the Break, in the position it takes on recoil; in running up, the Truck descends on the platform clear of the Break, having a motion on the joint B.

**Method observed in the examination of Guns mounted in all the Forts and Batteries of the United Kingdom.**

The examination of the guns mounted in all the forts and batteries of the United Kingdom, and probably to be extended to our colonial possessions, has already resulted in demonstrating the fact that much of our ordnance is, from various causes, in an unsatisfactory condition. This remark will not, of course, apply to new guns, either mounted during the last two or three years, or from which practice has not been carried on; but it is already sufficiently apparent that the iron of the gun rapidly tends to deteriorate when subject either to the exposure of sea air and salt spray, or to the action of gunpowder; and that, in fact, under the present process of its manufacture, it does not possess the requisite density and tenacity. The search has also resulted in showing in many instances that in guns out of which many rounds have been, and from which many more would have been fired, serious flaws existed, which could not be detected except by this peculiar proof, and that therefore the artillerymen were always more or less in danger, unknown and uncertain; and the only wonder is that, considering guns have hitherto been condemned mainly from over-venting, and that no record of their services has been kept, so very few accidents have occurred. However, the lamentable catastrophe which took place recently at Dover was the straw which broke the back of this mighty negligence, and opened the eyes of the authorities to the necessity of providing superior safe guards in the exercise of these formidable and dangerous engines of destruction. An officer of artillery, accompanied by a competent staff of practical men from the Royal Arsenal of Woolwich, was directed to examine each gun in the kingdom in a peculiar manner, and to report, as he proceeded, the result of his researches to the War Office.

The manner of the examination of the gun is simple and effective. The bore is thoroughly scraped of all its lacquer and paint, when it is illuminated by a lamp thrust into the

chamber, which reveals at once any large and apparent flaws. Should the bore pass this first simple test, it is next thoroughly examined and searched by an instrument with fish-hook extremities, which would not pass over any cracks and honey-combing in their progress. Any extended honey-combing would of course condemn the gun at once, or other inequality of the bore caused by the irregular passage of the shot down all smooth-bored guns. The last and most important test consists in taking an impression of the bottom of the vent, where it opens into the chamber. This is done by means of a ball of gutta-percha softened in hot water, and applied to the end of a shaft which is passed up the bore, when by the external application of a powerful wheel it is pressed with great force into the vent. It there rapidly hardens, and when released and withdrawn it presents a correct form of the vent in alto-relief. This model is most carefully examined by the working party; and it is found invariably that in guns which have been much used and are beginning to weaken, three small triangular excrescences are visible on the surface of the model, and which denote cracks more or less opened in the metal of the chamber, and which each discharge tends to widen a little, until the unlucky round is fired which must burst the gun. The moulds are then numbered and marked, and the gun itself ticketed with white paint, either for entire condemnation or for re-venting, as the case may be. It need scarcely be said that those which have the fatal cross which denotes the former verdict will not again be used.

Even if proof of the cracks is not to be discovered, an enlargement of base of the vent is scored against the gun, which will not be used again until it is rebouched with a new vent, if not condemned altogether. This enlargement commences with the very first round which is fired, caused by the tremendous effort of the gas to force itself up through the vent, and rapidly increases, especially with quick firing; but of course in this, as well as in the tendency to open a

crack, all depends upon the quality of the metal; and it certainly is very apparent that in the fusing of the iron of which our heavy ordnance is made, and in the casting of the guns, we have still very much to learn.

While England and France have of late years made rapid strides ahead in the manufacture of rifled ordnance, and have beaten all other nations in the race, the United States of America have not the less earnestly turned their attention to the improvement of the iron used in casting of their ordnance, and obtained by a long series of most interesting experiments some very extraordinary results. The bursting of the large gun on board their war steamer Princeton, and the carnage which resulted from it, caused them at once to institute an examination into the quality of the metal. This resulted in the discovery that in this cannon, while the metal stood only one-third the strain of English bars of fair quality, portions of it, when reworked, stood a tensile force nearly equal to that borne by the best hammered iron of American make. The effect of remelting iron was demonstrated in an increase of the specific gravity from 7.012 to 7.322, and an increase in the tenacity from 20,000 lbs. to 37,999 lbs. the square inch; and the correctness of the views of English manufacturers, that superior tensile property depended on a high density of the metal, was amply corroborated. But, for the attainment of this high tensile strength the iron requires often three remeltings. The fact was also satisfactorily established, that through keeping the iron in fusion, or by a long exposure of liquid iron to an intense heat, a very great improvement of quality was obtained, which increases according to the time of exposure up to some (not yet well ascertained) limit; and that if extended beyond that limit; (about three hours) the strength of the iron rapidly diminished. The guns thus cast at the South Boston foundry endured a very high proof, and the report stated that the cohesive power of the iron, so far as it can be shown by its capacity to resist transverse strains, is increased by its con-

tinued exposure in fusion no less than sixty per cent. It proved also that the quality of the iron was essentially changed by the various methods of treating it while in the melted state, and by different modes of cooling it after it was cast into the moulds; that it improved greatly in quality after it was melted for considerable periods of time, and that it was further improved by casting it into pigs and again remelting it. But it also established the fact, that a continuation of this process ultimately deteriorated the tenacity of the iron, and rendered it entirely unfit for use; also that various kinds of iron required their own particular treatment, in order to produce the best effects, in their various stages of progress. We purpose, in a succeeding paper, continuing a brief *précis* of these interesting and remarkable experiments.—*Army and Navy Gazette*, April 13th 1861.

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#### Captain Gloag's Breech Loading Fire-Arms and Cannons.

CAPTAIN GLOAG of the Madras Artillery, has just patented in this country "improvements in Breech Loading Fire-arms and Cannons" which relate to the combination and arrangement of the parts of breech-loading fire-arms and cannons, whereby the moveable breech of such fire-arms is retained securely in position, and a tight joint is obtained between the end of the barrel and the breech, so as to avoid windage or escape of gas when the explosion takes place. For this purpose Captain Gloag constructs a gun or other fire-arm or cannon with a moveable breech chamber, which moves on axes at or near its centre, such axes being supported and carried by the sides of a slotted frame or case, into the front end of which the barrel is firmly screwed. The back end of this slotted breech frame or case is bored and has a female screw cut therein to receive a hollow screw plug, which is suitably formed for being screwed or unscrewed by a key or lever applied thereto; and this breech screw or plug has a square passage through it, and a slot or opening is formed on one side, through which the nipple on the end of

the moveable breech passes when moved into and out of position for discharging and loading the piece. The back end of the moveable breech has a female screw cut therein of the same pitch as the breech screw just described, to receive the screw of the nipple, which closes the end of the breech, and to which is attached a sliding cartridge case or breech lining made of copper or other suitable metal, which projects a short distance from the end of the moveable breech, and comes up to a shoulder formed in the end of the barrel when the breech is screwed up ready for discharge, thus closing or covering the joint between the barrel and the breech. When the breech screw is screwed up tight, the square on its inner end passes over the square formed on the nipple, and thus screws up the nipple and forces the cartridge case or lining a short distance into the barrel, and when the breech screw is withdrawn a short distance, and the slot or opening formed in it is brought opposite to the slot in the frame or casing the breech may be moved horizontally or vertically on its axis into a position to receive a fresh charge, which may be of loose powder and ball, or a made up cartridge, or ordinary Government ammunition may be used.

The breech frame or case is formed with projections to attach it to the stock or carriage of a gun or other fire-arm in any convenient manner.

The cartridge case or lining to the moveable breech may be dispensed with, the end of the moveable breech being ground or accurately fitted and forced up to the end of the barrel by the breech screw, as previously described.

Fig. 1 Plate 17 shows a longitudinal section, and Fig. 2 a plan of part of a gun or rifle constructed according to one method, *a* is the moveable breech chamber, which moves horizontally on axes, these axes being carried by the upper and lower sides of the slotted frame or case *b*, into front end of which the barrel *c*. is firmly screwed and retained in position by a screw nut. The back end of this slotted breech frame or

Captain Gloag's Breech-Loading Fire Arms.

Fig. 1.

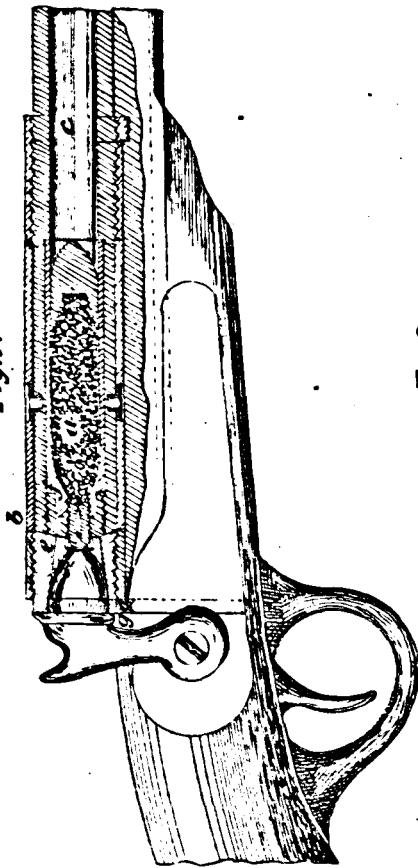
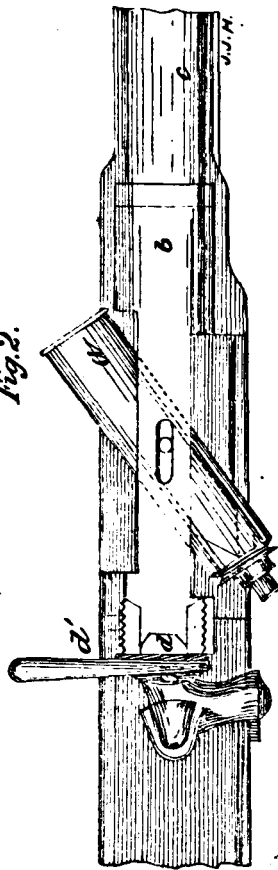


Fig. 2.





case *b* is formed with a female screw to receive the hollow screw plug *d* on the end of which a key or lever *d'* is fixed, which when moved into or out of position screws up or withdraws the breech screw *d*. The screw or plug *d* is formed with a square passage at the front end to fit over the square on the nipple; and there is a slot or opening on one side through which the nipple on the end of the moveable breech passes when moved into and out of position for discharging and loading the piece. The back end of the moveable breech *a* has a female screw cut therein (of the same pitch as the breech screw *d*), which receives the screw *e* of the nipple to close the end of the breech, and to this screw *e* is fixed the sliding cartridge case or breech lining *f*, made of copper or other suitable metal, which (when the parts are in proper position for discharge) projects a short distance from the breech chamber into the barrel, coming up to a shoulder formed therein, thus closing or covering the joint between the barrel and the breech when the discharge takes place. When the breech screw *d* is screwed up tight by the action of the lever *d'*; the square on its inner end acts on the nipple screw *e* and case or lining *f*, to force the end of the case a short distance into the barrel, as before described, and when the breech screw *d*, is withdrawn by the movement of the lever *d'*; the slot or opening in the breech screw permits the nipple to pass or move outwards when the moveable breech *a* is moved into position to receive a fresh charge. The breech frame or case *b* may be formed with projections to attach it to the stock or carriage of a gun or other fire arm in any convenient manner; or it may be secured as shown.

The advantages arising from the construction of guns or rifles according to these improvements will be seen from the following detailed description of the different component parts:—

The nipple being in the breech of the chamber, the communication with the charge is consequently direct. The

hammer strikes the nipple through the breech screw which is hollow. The joint rendered gas-tight not only by the contact of the muzzle of the chamber and the end of the barrel, but also by their point of junction being covered by a copper or other metallic cartridge or lining, which is advanced a sufficient distance into the barrel by the action of the breech screw. The casing of circular section has a hole through it lengthways, and rectangular slots are cut in its sides; threads of a female screw are formed in both its extremities for the purpose of receiving the barrel and breech screw; and it has a notch cut in its right side, at its back end, for the purpose of allowing the nipple to escape in the act of opening the breech for loading.

The cylinder or breech chamber for containing the copper cartridge, has a few threads of a screw cut in its interior at the breech end, as shown, for the purpose of receiving the male screw attached to the copper lining.

The male screw, by means of which the copper cartridge is advanced into and withdrawn from the barrel is firmly secured to the copper lining, having a square shoulder which fits into a hole in the breech screw; the nipple is screwed partly into this screw, and partly into the end of the copper lining.

It will be seen by examining the section, where the copper sliding cartridge case is drawn in the way it is entered into the cylinder, that the sliding cartridge can only move outwards, as much as the male screw *e* exceeds the female screw (in the cylinder *a*) in length, which may be  $\frac{1}{4}$  of a turn, and which is the distance the copper lining enters the barrel. The moveable breech chamber, composed of the cylinder *a*, the copper lining *f*, screw *e*, and nipple, turns on two pivots or axes in the casing as before described. The barrel *c* screws into the fore end of the casing, and is secured in its place by a screw nut. The breech screw is hollow, the hole through it at the front end or that which comes in contact with the breech of

the chamber is square for a short distance, it then widens towards the rear end, and becomes of a circular form; the square part of the hole through the breech screw fits the square shoulder on the screw *s*; by turning the lever *d'*, attached to the breech screw, the pressure is taken off the joint and the copper cartridge is withdrawn from the barrel (into which it enters when the breech screw is tightened) by means of the screw *s* (the shoulder on which enters the square hole in the breech screw *d*), and at the same time a notch or slot in the breech screw is brought to coincide with that in the side of the casing, thus permitting the passage of the nipple, and allowing the chamber to turn on the pivots into a position so that the operations of capping and loading can be readily gone through. The lever *d'* fixed to the rear end of the breech screw, when the breech is closed, lies in front of the hammer, where it may be secured to the lock plate by a catch or other convenient contrivance; when the breech is open it is in the position shown in the plan, being turned to the left as far as a stop on the stock will permit. The hammer strikes the nipple through the breech screw, and is made with a projecting ledge or rim round its nose at *g*, so that it may be forced back to half-cock by turning the lever to the left for the purpose of loosening the breech screw and opening the breech. The half-cock, supposing the hammer to be resting on the nipple, or on an exploded cap after a discharge, then the lock may be so arranged that on turning the lever to the left the hammer will be forced back as far as the breech screw moves outwards, when the half-cock notch should catch it, thus the plan admits of the breech being opened, and the hammer raised to half-cock by one motion of the lever.

When the breech is opened as at Fig. 2, and the operations of capping and loading have been finished, the chamber is turned into a position in line with the barrel (as far as the casing will permit), then it is obvious that the hammer cannot in any way fall on the nipple till the lever is turned

down to the right for the purpose of tightening the breech screw, and firmly closing and securing the joint. The hammer may be raised to the half-cock in the usual manner with the thumb, then the lever is turned to the left to open the breech, the breech screw moves outwards a little, and consequently the hammer cannot touch the nipple till the breech screw is tightened or advanced in order to close the joint. The flash from the explosion of the cap may be allowed to escape at the side or sides of the casing through a hole or holes made for the purpose,—*Mechanics Magazine*.

**Proceedings of the Committee for reporting on the Produce and Resources of India, on Mr. E. Loarer's Process for converting Oils into a Substance named Vegetable Wax.**

From

Mr. E. LOARER, *Madras*,

To

T. PYCROFT, Esq., *Chief Secretary to the  
Government of Madras.*

SIR,

I beg you to mention to the Honorable the Governor in Council that I discovered a mode of fabricating, so as to become a mercantile product, a substance which I believe I correctly state, had until that time only obtained in the experiments of the laboratory, and had continued but a curiosity in chemical science, of no commercial value. This substance I named vegetable wax, from its resemblance to that animal product. I obtained a Patent for it under Act VI of 1856 of the Government of India.

Since then, I have manufactured about 200 tons of that material, all of which has been sold, in Madras, Calcutta, and Europe; it has brought various prices, but I enclose a letter and its translation; by which it will be seen, though the produce is scarcely yet known, that the latest selling price at Havre was about £43 per ton of one thousand kilogrammes, or 2,200 English pounds. The Patent Act of 1856,

was repealed by Act IX of 1857, and my Patent rights, of course, fell into abeyance, but under Art. 35th of the new Act, they will be recovered by me immediately, after which the right of manufacturing and selling the product, will again become exclusively my own.

I submit samples of the vegetable wax as also of candles prepared by me of the same material; advices from Bordeaux shew that the power of bleaching it is possessed in Europe. I would now expose that the vegetable wax is made from the common lamp oil (castor oil) of the country, the plant producing which, as Government well know, is grown throughout the length and breadth of the Indian Empire, springing luxuriantly even on bare rocky soils, affording, therefore, exhaustless supplies of the raw material for the wax.

During the past two years my success in the manufacture and sale of the vegetable wax has been so great, that I have from its sale alone, almost acquired a modest competency, and I am now very desirous of earning a little more money in order to enable me to retire and settle in Europe.

I believe that the knowledge how to manufacture this product, if widely spread amongst the people, would add one more source of revenue to the State, and of profit to its people, and if Government concur in this opinion I offer to impart all my knowledge and dispose of all my exclusive rights for the sum of—, undertaking to teach for the next three months and fully instruct any number of servants or subjects of the State.

I will undertake to continue for that period to manufacture on my own account in this or any number of allotted towns, during all which time the community can be permitted freely to enter the workshops, so as by seeing all and working personally, all may become fully instructed in the art.

On the subject of my Patent rights, I need not further enlarge, as they can be submitted to the legal advisers of the State; but I may touch on the question of whether a secret

be possessed by me for fabricating this material; on this point, I have the honor to submit that my secret consists in my knowledge of how to produce the vegetable wax at a cost price which has allowed me to convert a chemical toy into an article of commerce; and that my process was and still continues a secret, may find proof, I think, in the fact, that though my specification was very full and all could peruse it, and though by the repeal of Act VI of 1856 I have remained for 15 months without any protection; though many knew I was making much money from its sale, and the keenness of competition seldom fails to detect a new source of profits, it has failed in the present case, for there has not, to my knowledge, been any one who has succeeded in producing a like substance.

I offer the same information for the twenty-two Civil Districts of the Madras Presidency, only, if my above proposal be deemed beyond the power of the Madras Government to treat for, reserving for me the benefit of the new Patent Act in the other part of the Indian Empire.

MADRAS, )  
 10th August 1858, ) (Signed) E. LOARER.

*Bordeaux, le 8 Avril 1857.*

Monsieur ED. LOARER, à Vellore par Madras.

Nous vous donnons par ce qui précède copie de la lettre que nous vous avons adressée le 7 Fevrier dernier, et comme nous vous le promettons, nous venons aujourd'hui vous entretenir de nouveau de l'Echantillon de cire que vous nous avez envoyé, laquelle a été soumise à diverses préparations, mais il est à regretter que la quantité en fut si réduite, et c'est là le motif qui a empêché de vous donner une solution plus prompte. Quoiqu'il en soit, c'est avec satisfaction que nous venons vous dire qu'il y aurait quelque chose à faire avec votre cire brute, c'est à dire jaune, et comme premier essai nous venons vous autoriser à nous en envoyer ici une dizaine de tonneaux aux conditions de votre

lettre du 6 Décembre 1856, en évitant les frais d'emballage puisque vous ne les croyez pas nécessaires. Nous sommes à peu près certains d'en obtenir un bon résultat. Cet envoi sera pour votre compte ou de compte à demi entre vous et nous, si cela vous convient mieux, mais il faudrait vous engager à n'en pas adresser à d'autres maisons de France, car le succès tient à ce que nous fussions seuls détenteurs de l'article et par la suite nous prendrions nos mesures pour vous en demander des quantités plus importantes. C'est donc une affaire à tenir secrète jusqu'au résultat définitif du premier envoi de dix tonneaux que nous vous conseillons.

Vous pourrez faire traite sur nous pour notre part d'Intérêt même payable dans Londres, au terme usité et vous pourrez donner au premier de la traite le Connaissance en garantie comme d'usage.

Veillez nous répondre le plus promptement que vous le pourrez, et recevoir nos salutations.

T. S. V. P.

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Bordeaux, le 22 Avril 1857.

Monsieur ED. LOAREU, à Vellore par Madras.

En l'autre part nous vous remettons copie de notre lettre du 8 Courant, et en même temps nous avons le regret de vous contre-mander l'ordre qu'elle contenait pour l'envoi de 10tr. de votre cire brute jaune. L'Industriel qui nous avait invités à vous le transmettre est revenu vers nous pour nous dire que son retrait d'ordre était motivé sur ce qu'il s'est aperçu de l'odeur forte que conserve votre produit, et c'est là selon lui un inconvénient des plus graves, et contre lequel il ne connaît aucun remède. *Il le regrette d'autant plus, qu'il avait obtenu en blancheur le plus haut degré possible.* Néanmoins il voudrait toujours que vous fissiez l'envoi de quelques quintaux pour pouvoir renouveler ses essais et expériences sur un plus grande échelle et nous vous engageons à le faire, de même qu'à nous indiquer le moyen de détruire la forte odeur si vous le connaissez.

Nous avons l'honneur, Monsieur, de vous saluer.

*Acheminée le 8 Mai, rien de nouveau.*

*Extract from the Minutes of Consultation in the Public Department, dated 24th August 1858,*

No. 1057.

Before coming to any decision on the subject, the Government resolve to refer Mr. Loarer's offer for the opinion of a Committee composed of the Officers named in the margin.

*Colonel A. McCally.  
Lieutenant Colonel G. Palfour C. B.  
Lieutenant Colonel F. C. Cotton.  
J. E. Mayer, Esq.*

(Signed) T. PYCROFT,  
*Chief Secretary.*

From

THE COMMITTEE FOR REPORTING ON THE  
PRODUCE AND RESOURCES OF INDIA,

To

THE CHIEF SECRETARY TO GOVERNMENT,  
*In the Public Department.*

1. In obedience to the resolution passed in the Public Department No. 1057 dated 24th August 1858, the Committee for Reporting on the Produce and Resources of India have the honor to state their opinion on the offer made by Mr. Loarer in his letter to Government dated 10th August 1858, Mr. Loarer offers, on payment of a sum of money to be hereafter settled, to place at the entire disposal of Government, for application by the people of the country and officials of Government within the proper limits of the Madras Civil (22) districts, a full practical knowledge of the mode he has discovered, of converting the abundant common castor and similar oils, into a solid substance resembling, and named by Mr. Loarer, vegetable wax: which can by his process be done at so small a cost, as to convert an article hitherto only obtained by experiments in the laboratory and of no commercial value, into a mercantile product of great extent;



and the knowledge how to manufacture this product, at a low cost, if widely spread amongst the people, would as Mr. Loarer considers afford an important source of revenue to the State, and of profit to its people.

2. The Committee beg to bring to attention, that at page 1653 of the 88th number of the Government Gazette of Fort William, there is a Notification in the Home Department, No. 1501 dated 1st November 1856, wherein Mr. Edward Loarer of Vellore is declared to have become entitled, under the provisions of the Patent Law Act VI of 1856, for a term of 14 years from the filing of the specification, to the sole and exclusive privilege of manufacturing vegetable wax, and that he has produced a certified copy, under the signature of the Under Secretary to the Government of India, of the filed specification dated 18th September 1856, to which the above Notification alludes.

3. The patent Law Act VI of 1856, has since then been repealed, but Draft Act 35 of 1858 (read a second time in the Legislative Council of India on the 24th April 1858, and republished in the Fort Saint George Gazette of 21st, May 1858) will, if passed in its present form, re-establish the patent right previously guaranteed to Mr. Loarer under the repealed Act VI of 1856; viz., for a term of 14 years from the date of the passing of the new Act.

4. The Committee have satisfied themselves by inquiry, that, excepting in connection with Mr. Loarer, vegetable wax has not hitherto been found amongst the Indian exports as an article of commerce, nor entered among the lists of exports from any part of India; and that in the solidified form in which presented by Mr Loarer, it may therefore be considered a new article of India trade.

5. The copy of the filed specification held by Mr. Loarer, sets forth several processes for converting certain oils into the solid substance, named vegetable wax; but as the solidification of castor and similar oils by the application of nitric

acid is described in various works on Chemistry, and as the descriptions in the published accounts so far resembled one of the chemical processes in Mr. Loarer's specification, although not so fully described, as to allow his details of working to become known, the Committee deemed it necessary to test the relative merits of the two processes, by causing experiments to be made on the limited scale to which the chemical book accounts apply, and on the extensive, simple, and economical scale, which Mr. Loarer considers peculiarly valuable in his processes.

6. The Committee were enabled to make the chemical experiments through the kindness of Surgeon Mayer, Professor of Chemistry in the Madras Medical College, who authorized his efficient practical Assistant Mr. Norton to carry on the requisite experiments; and the report of Mr. Norton thereon is herewith subjoined, having been submitted to and approved by Mr. Mayer.

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*Report of Mr. Norton, Chemical Assistant in the Madras Medical College.*

Process for converting Castor oil into Palmine.

*Experiment 1.*—10 Ounces of fine Castor oil treated with  $\frac{1}{2}$  ounce of fuming nitric acid, the mixture intimately stirred for about quarter of an hour and set aside, it solidified in 8 or 10 hours.

*Experiment 2.*—4 Ounces of fine Castor oil mixed with 3 drachms (fluid) of ordinary or commercial nitric acid, the mixture heated gently for 5 or 10 minutes at a temperature of 186° F. it was then set aside. The experiment was performed at 1 o'clock in the day, and the mixture was found solidified next morning.

*Experiment 3.*—10 Ounces of common lamp oil was heated to 186° F.,  $\frac{1}{2}$  an ounce of fuming nitric acid was added to it, the mixture stirred with a wooden spatula, and set aside at 6 P. M. it solidified at 6 o'clock next morning.

*Experiment 4.*—Experiment the same as No. 3 substituting half an ounce of commercial nitric acid instead of the fuming acid; it also solidified in the morning.

(Signed) G. NORTON,  
*Chemical Assistant, Medical College.*

*Note.*—By fuming nitric acid is meant nitric acid impregnated with fumes of nitrous acid.

*Note.*—By commercial acid is understood the acid as sold in the shops commonly called aquafortis.

*Note.*—8 fluid drachms are contained in a fluid ounce.

*Note.*—In the above experiments the quantities of acid and oil employed were by measure.

In experiments 1, 3, and 4 the quantity of acid to the oil is one twentieth part.

In experiment 2, the quantity of acid is nearly one-eleventh.

From my present knowledge, without instituting further experiments, it is my opinion that the quantity of commercial nitric acid to be employed for the conversion of Castor oil into palmine should not be less than one-twentieth part of the oil used, though a little less of the fuming nitric acid will suffice for the same purpose.

It is my belief that the conversion of Castor oil into palmine is not possible without an oxidizing agent as nitric acid, or some other process that will afford available oxygen.

(Signed) G. NORTON.

In order to employ palmine for the purpose of making candles it would be necessary to purify it; and to make good candles that will burn well, it would be desirable to separate the palmitic acid it contains, which can be done by a chemical process, and employ it for the making of candles.

17th August 1858.

(Signed) G. NORTON.

The whole of the above is in my opinion perfectly correct.

19th August 1858.

(Signed) J. MAYER.

7. Prior to the commencement of the above experiments it was clearly explained by the Committee, that the object of the enquiry was, not to induce Mr. Mayer to devote his time and knowledge or that of his Assistant Mr. Norton to the discovery of new or simple processes in this branch of Chemistry, nor to place one of the ablest Chemists in India or his efficient practical Chemical Assistant, in competition with Mr. Loarer, in order to find out that gentleman's mode of making vegetable wax, a result which with experiments might have followed, after attention had been drawn to Mr. Loarer's mode of solidifying oil by cheap processes as an article suited for commerce; the object of Government being only to ascertain by following the process described in chemical books, of converting oil into a solid form, (as in the specimen lately exhibited by Mr. Loarer as vegetable wax,) what would be the cost of the process carried out on an extensive scale, and to learn the value and kind of materials employed in the preparation of the article.

8. Having obtained the information above given by Mr. Norton, as to the several Processes and Chemical ingredients employed for the preparation of the different specimens according to the published chemical accounts, the Committee then requested Mr. Loarer to exhibit his Processes on such a scale as would enable them to judge of the merits of his

1	Experiment with 400 lbs. of oil.	process as regards simplicity,
2	" " 100 " "	economy and efficiency; and
3	" " 8 & 7 " "	the marginal entries here

shew the experiments made on Mr. Loarer's plan, in presence of the Committee, which were entirely successful.

9. The experiments both of Mr. Loarer and Mr. Norton exhibited the like chemical action; but the former produced vegetable wax with great economy in the use of the chemical ingredients, and employed them in such a mode as to satisfy the Committee by a careful calculation of the cost of the conversion, that Mr. Loarer's process is of a far more

economical nature than that described in Chemical works, as the following comparative calculation will shew.

10. In experiments 1, 3 and 4 by Mr. Norton the quantity of nitric acid used, was one twentieth part of the oil experimented upon ; at which rate the cost of manufacturing ten tons of vegetable wax would be as below : 22,400 lbs of oil would require 5 per cent. of nitric acid viz., 1,120 lbs.

1,120 lbs. of nitric acid at 1 Rupee a pound Rs.	1,120	0	0
Coolies for stirring.....	„	1	0
		<hr/>	
Cost for ten tons.....	„	1,121	0
For one ton.....	„	112	1
By Mr. Loarer's process No. 1, the cost is } per ton only.....	„	4	4
And by process No. 2, is only.....	„	1	11

Mr. Loarer's experiments in presence of the Committee were on a scale so large as to enable them to report with confidence as to their successful application to any quantity, and doubtless with yet more economy if on a very extensive scale.

11. By one of Mr. Loarer's processes, extremely simple, about 100 lbs. of oil were congealed in 8 hours; only one ingredient (sulphuric acid), in any way difficult to procure in the country, was used, and that only in very small quantity, sixteen ounces sufficing for obtaining 100 lbs. of vegetable wax. This process is admirably adapted to the country and may be adopted by the ryots without any difficulty; for although sulphuric acid cannot be manufactured at present in the interior, it is cheaply prepared at the Madras Mint (at 2 Annas per lb.) and is not difficult of carriage.

12. The next process, in which both nitric and sulphuric acids are used, is the best adapted for manufacture on a large scale; by this process 400 lbs. of oil were congealed in a wooden trough in 4 days, and Mr. Loarer has suggested an arrangement, and described an apparatus, which would make

this process of preparing vegetable wax on any scale, very simple.

13. The Committee have now therefore no hesitation in reporting that the manufacture of vegetable wax can be generally introduced into this country; thus enabling the grower of Castor and other similar Oil Seeds to carry oil to market in a solid and consequently more portable state: and with the diminished cost of carriage, the growers from the interior might advantageously sell their produce on the Coast, or export it to foreign countries, whereas at present the carriage of fluid oils is not only difficult, but costly.

14. Mr. Loarer in his excellent report upon the seed producing Lamp Oil, and its conversion into vegetable wax, has employed data, which it is not in the power of the Committee altogether to check; but having found such of the reports made by Mr. Loarer as they have been able to test, quite accurate, they are willing to accept his practical knowledge on these points as correct: and the Committee therefore call the earnest attention of Government to what Mr. Loarer has so clearly set forth.

15. In Mr. Loarer's paper several uses to which vegetable wax may be applied are pointed out; and that he is right in his views as to the varied applications of this article the Committee think no one, after careful inquiries, can entertain any doubts, and feel sure that when once this product is fairly tried and introduced into England, it will take its place there amongst the most valuable imports.

16. Any new oily substance so economically manufactured as the vegetable wax, is sure to be applied to many important uses; and as it will undoubtedly compete, successfully as regards cost, with the cheapest oil or fat now employed in England, there can be no doubt as to the result. Even in India, Mr. Loarer has made a considerable profit upon the vegetable wax, having sold some to the Madras Railway for use, and some to other parties for export to Europe; and the

Committee have no doubt that with the great reduction in price which Mr. Loarer anticipates being able to make, the article will speedily overcome the temporary objections lately raised.

17. The Lamp oil and Castor oil seed plant is grown in all parts of the country and on the poorest soils, the arid nature of the country, and the climate of Southern India being particularly suitable for its growth; and Mr. Loarer's cheap process of converting the oil into wax, will, by enabling the Ryot to store the solid substance far more easily than the seed or fluid oil, lead to the oil being expressed from the seed whilst clear and free from impurities: and its utility being thus increased, the export of vegetable wax will probably increase as rapidly as did that of gingely oil seed, when the fact was once established, that the oil it yields was applicable to the same purposes as olive oil.

18. The Committee consider that they cannot lay too great stress on the vegetable wax having the advantage of being easily stored, and transported from the interior on the rudest conveyance and in the simplest and cheapest form; it can be loaded upon carts, on bullocks, or in any way best adapted to the habits of the people, and sufficiently protected from injury and from weather by the ordinary leaves and mats of the country, requiring neither casks, dubbars, nor boxes to convey it. It can further be solidified into any portions or shapes, and on board ship can be stowed in any convenient corner; requiring no protection against leakage or bilge water, and by its nature it can be packed so close, that no danger from shifting of cargo or injury to the article from rubbing, need be apprehended.

19. The Committee have already alluded to the various uses to which the vegetable wax can be applied, and expressed confidence in the various applications which Mr. Loarer claims for the substance. The Ordnance and Public Works Departments, in this country will readily find many after uses to which the article can be applied, and doubtless prac-

tical experience and time will extend these uses. The Railway Authorities have already purchased the vegetable wax to a considerable extent for lubricating; and when once the sale is open, the price of the article will be very low, and the Officers of the Railway will be enabled, by mixing with it other substances, to render it suitable for the purpose of grease, at a very small cost. The recipes for preparing the Railway grease employed in England and in Belgium, require soda water, oil, and suet or tallow, combined in certain proportions; whereas Loarer's vegetable wax if used as the lubricating agent to form the main ingredient in the composition would, at the rate at which it could be purchased in an open market, allow of a considerable saving in the present outlay for grease for Railways; and at the same time, an article would be obtained, which the experienced Manager of the Rail considers to be superior to all other mixtures as a lubricate.

20. The consumption of tallow and fat in the Ordnance Department in the year 1857-58 was 10,772 lbs., at an outlay of Rupees 3,989; and taking the highest price of oil, viz., 60 Rupees per Candy of 500 lbs., the price of the above quantity of tallow and fat is about three times the cost at which an equal weight of vegetable wax can be prepared by Mr. Loarer's process; and if used for only some of the purposes to which fat is now applied, a considerable saving would be effected by the introduction of this substance. The large consumption of grease at the Railway would also give a considerable margin, in favor of the vegetable wax.

21. Looking to the extensive benefit to be derived by the people of the country from a knowledge of this mode of obtaining vegetable wax, by bringing into practical and extensive demand the most common article of produce in this country, (oil) the cost of which will by Mr. Loarer's discovery be diminished in various ways, and considering the vast pecuniary interest the Government of this presidency has in the extension of cultivation and the increase of useful exportable



articles, by reason of the direct revenue drawn by Government from the lands of the country; the Committee recommend the sum of Rupees 5,000 to be paid down to Mr. Loarer, and Rupees 5,000 more to be paid on 500 tons of vegetable wax being exported; with the proviso that Mr. Loarer shall thoroughly instruct in his process, such persons as the Government shall appoint, in suitable localities; Government paying Mr. Loarer's travelling expenses when requisite, at a moderate and fair rate of eight Annas per mile. The Committee recommend further, that if at any time within 20 years, 5,000 tons of castor or other oil in a solidified form be in any year exported from the ports of Madras, an additional sum of Rupees 5,000 be granted to Mr. Loarer, or his heirs.

22. The Committee observe that Mr. Loarer's offer only applies to the 22 Civil Districts of the Madras Presidency; but in case Government accept the offer, the Committee think it should be agreed that the Madras Government Establishments wherever stationed, whether beyond sea or otherwise, should have the right of using the process for producing such quantity of vegetable wax as may be required for their own bonâ fide use.

23. The Committee enclose in a sealed envelope (marked "Confidential") a Memo. drawn up by Mr. Loarer, explaining fully, clearly, and in minute detail, the whole of the processes and modes of operating; also giving much information and offering suggestions of a useful nature in reference to his discovery. This paper is confidentially sent for the information of Government, until the terms on which Mr. Loarer yields his rights to the patent have been agreed to.

(Signed) G. BALFOUR, Colonel,  
*Inspector General of Ordnance.*

MADRAS, ) (Signed) FRED. C. COTTON, Lieut. Col.,  
14th Sept. 1858. } *Engineers.*

(Signed) G. Y. SIMPSON, Lieut. Col.,  
*Artillery.*

P. S.—Enclosed is a memoir drawn up by Mr. Loarer in which there are two original documents inserted, also a letter in original from that gentleman dated September 1858.

(Signed) G. BALFOUR, Colonel.

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*To the Members of the Committee for the examination of my manufacture.*

GENTLEMEN,

I enclose a sealed packet for the exclusive and confidential perusal of the Members of the Madras Government and of the Chief Secretary and Secretary to Government in the Revenue Department. I submit it, because I am desirous of evincing my specimen, having in the enclosed document explained every thing connected with my manufacture. This report contains all information of every kind connected with the process of manufacture which I am capable of detailing in writing.

I have attached to the paper enclosed, original documents of value to me; if Government accept of my offer this document will of course be printed, and a printed copy will be to me of sufficient value, but if my offer for the Madras Presidency be not accepted, I must beg that the enclosed documents be wholly and carefully returned to me.

My address will be Monsieur E. Loarer, care of Messrs. Robert and Charriol, Agents, Vansittart Row, Calcutta.

I have &c.,

(Signed) ED. LOARER.

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CONFIDENTIAL.

*To the Members of the Committee for the investigation of my manufacture of Vegetable Wax*

GENTLEMEN,

I beg, before going into any details about the said manufacture, to explain that, when I proposed to Mr Cammiade

the sale of my secret and interest in the manufacture of vegetable wax for the presidency of Madras, I had no knowledge of the new Act, save the following para. of *the Examiner* of the 27th July 1858: "The *Hurkaru* says, that the long projected Patent Law will shortly come into operation in India, the Home Authorities having decided that the Governor General, as the Vice-Regal Authority in India, by virtue of his office, is empowered to grant Letters Patent."

The first notice given to the public of Madras of the new Act was by the *Madras Spectator* of the 29th April 1858 in the following terms, "Legislative Council of India, 17th April 1858: Mr. Peacock moved the first reading of a bill for granting exclusive privilege to inventors in lieu of Act VI of 1856, &c. New bill for granting exclusive privilege to inventors read a second time the 24th April 1858."—See *Fort Saint George Gazette of the 21st May 1858*.

I beg to direct the attention of the Committee to Art. 18th and 19th, of Act VI of 1856 as regards the validity of my Patent rights under the old Act and to Art. 35th of the Act read a second time on the 24th of April 1858 as to the maintenance of my Patent as granted under Act VI of 1856.

My specification has been filed at Calcutta on the 18th of September 1856, and registered at the Home Department under No. 7, on the 20th of September 1856.—See *Fort William Gazette, 1st of November 1856, No. 88, page 1653*.

*Home Department, Notification, No. 1591*.—After the preamble are the following words:

No. 7, Edward Loarer of Vellore for the production of vegetable wax.

I beg to remark that in virtue of the new Act, my fourteen years of privilege will begin from the day of the publication of the new Act, and not from the day I filed my specifica-

tion, the above documents I respectfully submit will settle all questions as to the validity of my Patent rights.

I will now give accurate details of three different processes for the manufacture of vegetable wax, declaring at first that the process found in the books of Chemistry are impracticable in a commercial point of view,

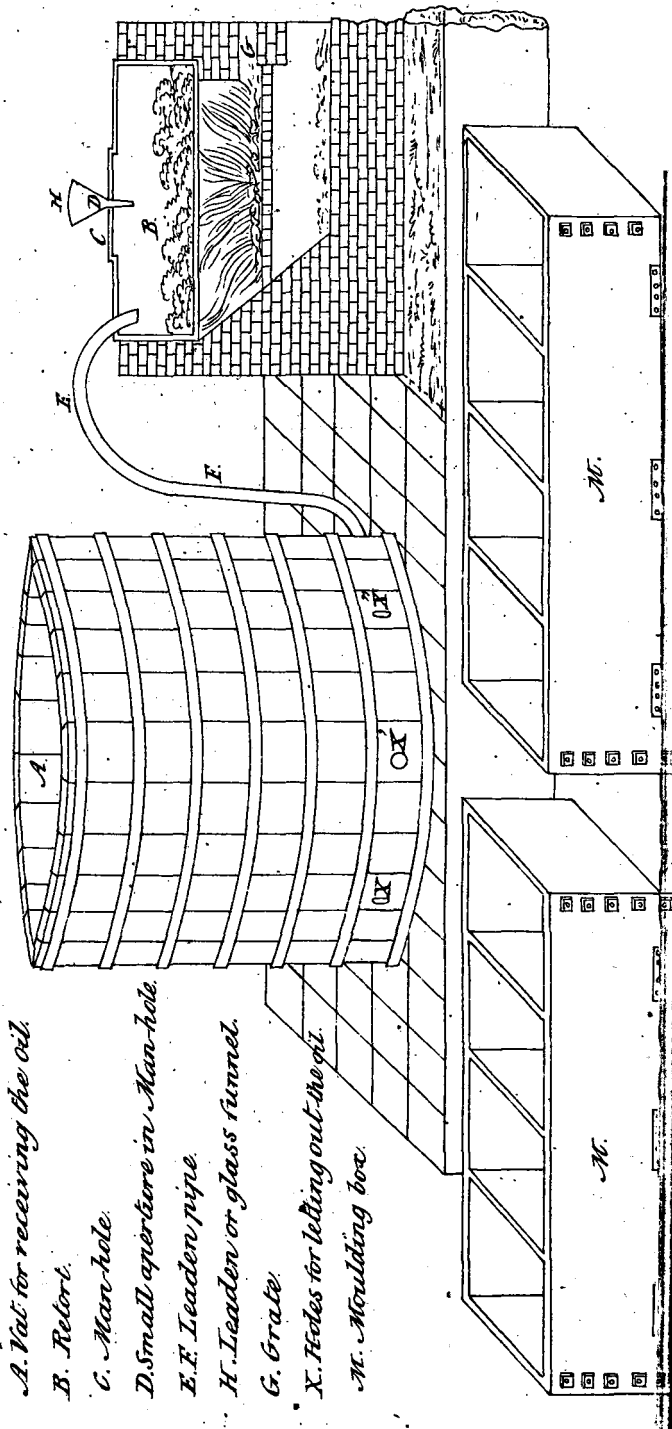
#### 1ST. PROCESS.

This is the cheapest of all, and is well adapted for villagers and ryots. A common earthen pot being the only apparatus necessary.

One part of common unrefined Saltpetre.

And one part of Sulphuric acid being mixed at the bottom of a pot of sufficient size, as soon as the mixture is well saturated, a hundred parts of common Castor oil is slowly poured upon the mixture, and the whole is heated on a slow fire until it reaches a temperature of about 160° Faht. (more or less is not the question provided the oil does not boil) I never used any means for ascertaining the temperature of the oil but my finger, being careful to stop the fire as soon as the heat would not allow me to keep my finger into the oil, the compound is then allowed to cool and may be then decanted into another pot or box made water-tight and it is then well stirred when it begins to thicken. This process will last about 8 hours and the cake will come out of the mould three or four days afterwards, in a hard lump ready for packing into plantain leaves and gunny bags; square boxes of 18 inches on every side, are the best things for moulding, at least one of the sides should be moveable, to facilitate the exit of the cake when it hardens. I strongly recommend an active stirring when the paste thickens, as it betters the color of the vegetable wax.

• Washing the cakes when they come out of the moulds is very useful for taking away all viscosity—if the cakes are left in the moulds eight or ten days it will be better.



A. Vat for receiving the oil.

B. Retort.

C. Man-hole.

D. Small aperture in Man-hole.

E. E. Leaden pipe.

H. H. Leaden or glass funnel.

G. Grate.

X. X. Holes for letting out the oil.

M. Moulding box.

Cost of manufacturing a ton of 2,240 lbs. of vegetable wax, not including the price of 2,240 lbs. of oil.

20 pounds of crude saltpetre... ..	Rupees	1	4
20 pounds of sulphuric acid... ..	"	2	8
Fuel... ..	"	0	2
Coolies for manufacturing and packing ... ..	"	0	8
			<hr/>
Total Co.'s Rs.....		4	6

I prefer crude saltpetre to refined nitre, as the former yields by its combination with the sulphuric acid, a notable quantity of chlorine, which has a bleaching property on the wax; more it is cheaper.

#### 2ND PROCESS.

For a large manufacture the above process would become tedious.

1st. As it is difficult to procure pots of 20 gallons.

2nd. As the pots are very often broken, entailing a great loss in raw materials.

3rd. As the pots will hardly stand more than eight or ten operations, being very soon corroded by the bi-sulphate of potash formed during process.

The adjoined plan (Plate 18) is the model of a plant for manufacturing ten tons at every turn.

*A*—Is a large vat or tub made to contain two thousand gallons, at two inches above the bottom are a number of holes *X X' X''* with leaden pipes for drawing out when required, the contents of the vat.

*B*—Is an iron retort in the form of a gas cylinder with a man's hole at *C*—in the centre of the cover of the man's hole is a small aperture *D* half an inch in diameter for pouring in the acid—this small hole may be stopped with baked clay or wood.

*EF*—Is a leaden pipe connecting the still *B* with the bottom of the vat.

*M*—Is one of many moulding boxes, with one moveable side and moveable diaphragms; distant one from another 18 inches and dividing the boxes into an exact number of cubic cells 18 inches on each dimension.

The machinery being thus ready, the vat being full of oil, the retort will receive a load of *seven pounds* of crude nitre for every *thousand pounds* of oil in the vat—the man's hole must then be well secured and luted and the sulphuric acid is poured upon the nitre, through the small aperture *D* using a funnel with a long neck, the small aperture *D* is luted or stopped, and fire is kindled under the retort *B* (Nota:—to every pound of crude nitre allow a pound of sulphuric acid du commerce): first a slow fire, then a very brisk one should be applied during two or three hours, the oil in the tub will become gradually heated till it reaches 120 to 130, Faht. when the evolution of gas is no more perceptible in the oil, the stopper *D* should be opened and then the fire is taken out of the grate.

The whole is allowed to cool during the night, and next morning a light film much like cream on the top of milk, is perceptible on the top of the oil, it is then time for opening the holes *X X' X''*—the liquid is let into the moulding boxes, where it must be actively stirred as it thickens, as long as the magma will allow a strong man to stir it. The diaphragms are then inserted into the moulding boxes and the whole is left to itself for five or six days, the boxes may then be opened, the diaphragms removed, the cakes taken out, washed, allowed to dry for one or two days on platforms, and then packed into plaintain leaves and gunnies.

If the moulding boxes are made of partitions exactly of 18 inches cube, each mould will weigh 225 pounds, ten packages to the ton, and very convenient for stowing on board.

*Cost of ten tons by 2nd Process.*

155 pounds of crude nitre.....Co.'s Rupees...	6	0
155 pounds of sulphuric acid du commerce.....	„	10 0
Firewood.....	„	0 8
Coolies, working and packing.....	„	1 10
<hr/>		
Cost of manufacturing 22,400 pounds.....Total.....	18	2
	or per ton...	1 13

**3RD PROCESS,**

A large vat, square or round, being made of wood or sheet iron must be supplied with a fan horizontal or vertical, the bottom of the vat must be calculated so as to leave no corner unstirred by the motion of the fan, the bottom of the vat must be well coated with a mixture of vegetable wax and rosin to preserve it from corrosion by acids, this being done, the vat is filled with oil and three quarters of a pound of nitric acid is put into the vat for every hundred pounds of oil contained in it, the mixture must be then well stirred by the fan, ten minutes for every two hours, until the oil becomes thick viz., after three or four days, the composition should then be decanted into the moulding boxes and there stirred very actively (as in 2nd process.)

Nota—This process is very expensive compared to my first and second process, and should never be resorted to. I better the product of this process by the addition on the second day, of one ounce of sulphuric acid for every pound of nitric acid, poured into the vat the first day, this betters the color of the wax and accelerates the result of the operation, but after all, this third process should not be resorted to, as long as it is possible to work the 1st and 2nd process.

*Candle Making.*

Candle moulds being prepared in the usual way with wicks and laid into the casting table, the oil prepared by one of the above processes, should be cast into the moulds, at the



precise moment when the composition has reached [the consistency of thick congee water,

The candles must then be left to themselves into the moulds, for 5 or six days, when they will come out with a fine gloss and a light saffron colour.

NOTE.—A very great improvement is operated in the quality of the candles, by passing a current of chlorine gas through the oil during the process of solidification, when that is made with proper care, a three fold object is obtained :—

1st. Specific gravity increased and melting point raised.

2nd. Colour much improved.

3rd. The melted stuff never runs when the candle is lighted.

My candles are self snuffing a very important item, many terrible conflagrations having been caused by the snuffing of candles.

I must confess that I have yet to learn the composition of a good sort of wicks, before I can bring my candles to perfection as an article for the million. There is at Calcutta a manufacturer of wicks on the French principle, and they sell wicks readily to every one who wants them.

Cost of 2,240 pounds of candles of vegetable wax :—

Four and half candies of oil at 45 Rupees per candy.....	202 8
Working of the oil into vegetable wax, (2nd process).....	1 12
Additional cost for chlorine.....	1 0
13,440 wicks at 100 per Anna and cooly.....	9 0
Other expenses .....	0 8

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Total..... 214 12

Cost to the manufacturer of one pound of candles 1 Anna and 7 Pies, or at the utmost 2 Annas per pound of candles.

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Having described the manufacture of vegetable wax I will now consider its mercantile value and its applications in the arts and industry.

1st Vegetable wax is an excellent lubricator, it has been extensively used on the Madras Railway and I submit a letter from Mr. Fletcher the traffic Manager.

“ I find Loarer’s grease capital—we are now using nothing else, I was sorry to hear yesterday that his money had not been sent to him yet, I will see that it is sent to him next pay day which should be by the bye to-day. Do you think if Mr. Loarer were to make his grease softer—and so better fitted for immediate use—that it would be cheaper per lb? The drawback to it is its cost and hence we have been trying all sorts, but none can compare with his.”

(Signed) H. A. F.

It is in my power to make it of different degrees of consistency without lessening its high resistance to heat, it will answer when softer for any description of machinery, and will take with a notable economy the place of tallow so expensive for steam Engines.

2nd. Vegetable wax can be bleached perfectly white, the fact is proved by a letter from Messrs. Sempé and Co. of Bordeaux and I have sent to the exhibition of Madras in April 1857 a box containing some 30 pounds of my vegetable wax bleached by myself at Vellore, simply by exposure to the sun and dew, and by keeping it continually sprinkled with water, three days of that treatment are sufficient for bleaching the vegetable wax perfectly white. Chemistry has more expeditive and cheap means of bleaching such as chlorine, oxygen gas, sulphurous acid, &c.

3rd. Very good and cheap candles are made, immediately from the raw material, *and without any chemical preparation whatever.*

4th. That vegetable wax can be converted into soap, there is not the least doubt, all fat bodies are convertible into soap; I have made some tolerable samples of soft and hard soaps, though I have never seen a soap manufacture.

5th. About a hundred pounds of my vegetable wax has been treated under my eyes at Calcutta by a manufacturer of stearine candles, and it has been as easily converted into stearic acid as is the tallow by the same process. The produce of tallow compared to vegetable wax was :

Tallow produce, Stearine 55, Oleine 43, loss 2.

Vegetable wax „ 48, Oleine 48, loss 4.

The manufacturer of Calcutta said that with care and a more complete acquaintance with my vegetable wax he would succeed in bettering the difference of produce between the two fats ; that he did not buy my grease for his manufacture, may very easily be accounted for, by stating, that the price of tallow at Calcutta, varies from 12½ to 14 Rupees per Indian maund and that I tendered him my vegetable wax at 2½ Annas per pound, to be taken at Madras, all charges for him,

6th. Vegetable wax is a very good substance for the preparation and keeping of all sort of leathers and hides. such as accoutrements for the army, harness, boots, ropes made of raw hides, &c., this substance never hardens, and never changes by exposure to the air, into a sort of varnish, rendering the leather hard and prone to cut, as is the case when tallow is mixed with oil. I have no doubt that at home the tanner will find that stuff to answer as a succedaneum for more expensive oils, such as whale oil now in use. I have during the last three years used nothing else for the harnesses of my horses and it answered very well,

7th. Vegetable wax is the cheapest material to be used for the preservation of all articles of iron of comparatively small value, such as bar iron, steel, Engineers and Artillery tools and spare pieces, the inside of guns, grape shot, &c., and in one word all articles of iron kept in store rooms and godowns, where they go to decay in so short a time—vegetable wax would equally do for round and hollow shots, but for the tremendous heat attracted by the black piles of shots in

the Arsenals, in these tropical climates. I have no doubt that it would prove superior to any coating now in use for shots, if the piles were only protected from the heat by the commonest sort of covering; for ships of war where shots go so rapidly to decay I think my composition capital; the Committee is well aware that shots covered by any sort of lacker, may become very dangerous in a moment of need, causing guns to burst if they do not go home on the cartridge, or at least rendering a gun unserviceable for a long time when sometimes it is the more wanted; my grease never drying, will never interfere with the progress of the shot inside the gun, nay it would on the contrary facilitate its entrance into a foul gun.

8th. Before I could affirm that my composition is good for the preservation of *small arms* and *polished steel*, I think it necessary to make long and accurate experiments, but from this day, I must recommend the melting of the vegetable wax into boiling water, so as to expel all excess of oxygen from the compound, I then think it fit for use.

9th. Vegetable wax being easily made of various consistency with a nearly fixed melting point, varying from 140 to 155° Farht. is the best thing for greasing the axles of gun carriages and waggons of the Artillery, Engineers and land transport corps.

10th. The same substance may with great advantage and economy, be substituted in the studio of the statuary and the workshop of the moulder and caster in bronze or brass, to the bees wax which is now very extensively used and costs about eight times more—a mixture of 8 parts of vegetable wax and two parts of bees wax is I think superior even to pure bees wax for ductility and evenness of grain.

11th. Colonel Pears told me that he had no doubt that the vegetable wax would answer for the atmospheric Railways, he said that the only cause preventing the extension of the

system, was the impossibility of finding a lubricating body, resisting a great heat and cheap enough for large workings.

12th. I think I can affirm that vegetable wax is a specific against white ants, as I have had my machinery standing on the ground for the last six months into an open shade, and though the frames of the door and posts have been devoured by the white ants not one came near my moulding boxes, all notwithstanding being made of mango wood.

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*Vegetable wax in a commercial point of view.*

Vegetable wax is manufactured from the coarsest sort of lamp oil, (Castor oil the produce of *Ricinus communis*) v. Balfour's Cyclopædia of India. Castor oil seeds are planted in July in the Districts of North and South Arcot, Salem and Coimbatore, the crop is gathered in February—the seeds are sown only on the poorest description of dry land, whose assessment is from  $1\frac{1}{2}$  to 3 Rupees per cawny.

Many varieties of *Ricinus* grow wild in Bengal, upper India, Malabar, Canara and Guzerati (vide Dr. Balfour's Cyclopædia of India para. 2,457—5,740—7,165 and particularly page 1607 and following) all these plants produce seeds containing an oil appropriated to the manufacture of vegetable wax.

The land for Castor oil seeds receives five ploughings, deep furrows are then traced on the field with a plough, and a man deposits one or two seeds every three and sometimes every two feet, into the furrows and covers the seed with earth by a slight motion of his foot, the furrows are about three feet apart, sometimes more—when the *Ricinus* seeds are planted in that way, the whole field is sown broad cast with one of the three following seeds—1st Thowaray (*caganus indicus*) 2nd Ooloondoo (*phareolus mango*) 3rd Caramany a plant of the leguminose family (see Dr. Balfour's Cyclopædia of India para. 2,508) the average produce of one

cawny of that description of land, planted in ~~oil seeds and~~ <sup>oil seeds and</sup> small grains is 1,000 lbs. of oil seeds and an equal quantity <sup>of the small grain</sup>—the Castor oil seeds and small grain generally fetch the same price in the market of Vellore, viz., 14 to 16 seers per Rupee, when the soil is richer, the produce is sometimes as much as 2,500 and 3,000 pounds of Ricinus seeds per cawny—but my object being to show to what use may be brought the large tracts of waste land found in the Carnatic, I will consider only the poorest description of land, and I give herewith an accurate statement of the expense of cultivation and produce of dry land assessed near Vellore at 2 Rupees per cawny: having had during two years, large plantations in that district, I can vouch for the accuracy of my statements.

Cost of cultivation of one cawny of dry land planted in Ricinus seeds and Thowaray—with the price for reducing the crop into oil.

Paid to Collector for Government revenue.....	2	0	
Ploughing 3 times, 1 Rupee each turn.....	3	8	} That is the price I paid to ryots but when working one for another they do it for nearly half the price.
Children for bushes, weeds, and stones.....	1	0	
Sowing one cawny and covering.....	0	4	
Nine seers of castor oil seeds.....	0	9	
Nine seers of Thowaray.....	0	9	
Harvesting and packing.....	2	0	Same observations as above.
Manufacture of the seeds into oil.....	5	0	
Carriage to Madras.....	2	0	
Total cost Rupees.....			19 6

Produce and sale of the above, a measure weighing about 4 pounds.

250 measures of oil seeds at 1 Anna each.....	15	10
250 do of Thowaray 1 ,, each.....	15	10
Stalks and straw.....	3	0
Total produce Rupees.....		33 4

as I have brought to account all the expenses for ploughing, sowing, harvesting, manufacturing and packing the crop, at a very remunerative price for the ryot (for such were the prices paid by me, when employing villagers at my farm of Lattery near Vellore) the net profit of the ryot will be 14

Rupees per cawny, after having been paid for all his works,  
*Nota.*—When oil seeds sell for one Anna a measure it is a very remunerative price, oil then sells at 40 Rupees per candy :

Good sound seeds are well known to yield from 43 to 45 per cent. of dark lamp oil, by the boiling and roasting process ; oil prepared by that process is very thick, black and viscid, I prefer it for my manufacture of vegetable wax as the albumen in the seeds has been destroyed by the roasting process.

Oil of a better color and more fluid is prepared by boiling the seeds, then peeling them and afterwards passing the almond to the mill but the yield is but from 36 to 40 per cent.

Last, a limpid and perfectly fluid oil well known at Madras as *Cold drawn Castor oil* is obtained for medical purposes and sold by Apothecaries. The produce of a hundred pounds of Ricin seeds in *Cold drawn Castor oil*, is very seldom above thirty-three pounds.

(For very complete details of the history, natural and commercial, of the oil seeds in general and Castor oil seeds in particular and on the manufacture and prices of that oil—See Dr. Balfour's Cyclopædia of India, page 311 and Seq. page 1326 & Seq.)

When I began my manufacture of vegetable wax in 1855, lamp oil sold at Madras for 32, 33 & 35 Rupees per candy of 500 pounds. I had then lamp oil at Vellore at 30 Rupees per candy of 550 pounds—oil has since raised in price on account of the great demand for my works, to 43 and 45 Rupees.

The chances of a tolerable crop in barren land such as is assessed at  $2\frac{1}{2}$  Rupees per cawny is two good years and a bad one—great rains are most dangerous to the plant as soon as

it begins to flower—the plant flowers during the end of September and all October, these two months are very critical for the prospect of the crop. The Castor oil plant withstood very well the terrible draughts of 1854 and 1855, the crops of these two years were average ones—the great rains of September and October 1857 have destroyed the whole plantations of last year, the consequence was that the price of lamp oil rose from 40 Rupees in October 1857, to 55 Rupees as it stands now.

With oil selling steadily at 45 Rupees per candy, the culture of the Ricinus is very remunerative, and if the Ryots were sure of always selling their oil seeds at one Anna per seer they would till thousands of cawnies now left barren—If the Ryot had further and certain means of disposing of that part of his crop without passing through the claws of half a dozen Vaniahs, he would very soon better his condition and in the mean time contribute an unexpected source of revenue to the State, for it is necessary to understand, that not one inch of the land now under cultivation for cereals, should be given to the cultivation of oil seeds, the Ryot would resort for this supplement to his revenue, to tracks of land never cultivated before, and Government knows there is no lack of waste lands—One of the best means for enhancing the abundant production of castor oil seeds would be the establishment of central work shops were the seeds could be converted into oil and vegetable wax for the Ryot himself, on payment of a small per centage.

I will now show that I can very well afford to pay 45 Rupees per candy of oil, and that it is cheaper to convert oil into vegetable wax for shipment, than to send Home the oil in casks.

Cost of ten tons of vegetable wax at the Custom House, Madras:—

25,000 lbs of coarse lamp oil at 45 Rupees per	
candy.....	2,250 0



Cost of reducing the same into vegetable wax.....	25	0
150 gunny bags and thread for packing.....	30	0
Plantain leaves for the inside of packages..	1	0
6 Coolies for packing.....	1	0
Carriage from Vellore to Custom House Madras at 2 Rupees per candy—not per Railway but by bullock carts—Railway being cheaper but not so careful as bandy men.....	100	0
Commission to a Shipping agent $\frac{1}{2}$ per cent.....	12	0
		2,419 0

Cost of same quantity of oil bought at Vellore and sent to Madras for shipment.

25,000 lbs of coarse lamp oil at 45 Rupees per candy.....	2,250	0	
25 carts carrying eight dubbers, 6 Rupees per candy.....	150	0	} Each empty dubber weighs 26 pounds.
Hire of 200 dubbers at 2 As. per 15 days.....	50	0	
Leakage 5 per cent (minimum).....	112	8	
Commission for receiving, measuring, storing, and emptying, $2\frac{1}{2}$ per cent.....	56	4	
Return of dubbers to Vellore, 4 Rs. per 50 dubbers....	16	0	
			2,634 12

Difference in favor of vegetable wax, only for the very short voyage from Vellore to Madras, Rupees 215-12; we will continue the voyage down to England, and at every step we shall see the difference of cost widening.

Coarse Castor oil is not exported to Europe merely on account of its low price, which does not admit of the heavy expenses of casks, leakage and shipment. I will give herewith the continuation of the voyage of the 25,000 lbs. of oil alluded to above.

We have at Madras on one side 25,000 lbs. of vegetable wax packed ready for shipment and deposited at the Custom House, a mere shipping Agent passes the goods by the Custom House and all is over.

*Vegetable wax.*

25,000 lbs. of vegetable wax arrived at the Madras

Custom House.....	2,419	0
5 boats for shipping, 2 tons per boat for 3 Rupees.....	15	0
Coolies for do. 10 at 2 Annas.....	1	4
Export duties, 3 per cent on 2,500.....	75	0
Freight to 10½ tons HEAVY at 2 £ per ton.....	210	0
Insurance, dock charges, commission, &c.....	X	0

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Total cost in London..... X + 2,720 4

*Lamp oil.*

25,000 lbs. of lamp oil in the godown of the Agent

at Madras.....	2,634	12
Charges from godowns to Custom House.....	20	0
40 casks at 12 Rupees 8 Annas each.....	500	0
Export duties 3 per cent on 3,300.....	99	0
Freight of 50 casks of oil at 12s. 6d. per cask.....	350	0
10 boats, each taking 4 casks at 3 Rupees per boat.....	30	0
Insurance, dock charges, commission, &c.....	X'	0

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Total cost in London..... X' + 3,633 12

X' will always be heavier than X but we can afford to put them as equal and eliminate them, we will have then the following results.

2,720 for vegetable wax.

3,633 for lamp oil.

But oil is subject to a considerable leakage, and the minimum reckoned upon is 20 per cent; we must then add 20 per cent. to the price of lamp oil and we will have then

Price of 25,000 lbs. of vegetable wax in London.....	Rupees 2,720
Do. of 25,000 lbs. of lamp oil in London.....	„ 4,356

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Difference for vegetable wax..... 1,636

As I have the means of re-converting my vegetable wax into lamp oil by a very simple and economical process, the above result is not without importance.

The price of coarse castor oil in London varies from 4½ to 6 pence per pound according to demand—vide London Public Ledger, the most complete commercial advertiser.

The price of my vegetable wax, though completely new in the market, has never been under £ 38 per ton ; it sold at Havre on the 25th of June 1858 at 51 and 52 Francs per 50 kilogrammes.

The duty on that produce is fixed in France at 50 centimes (5 pence) per hundred pounds ; in England it enters duty free ; vide London Public Ledger of the 25th January 1858, art. wax, public sales. 516 Baskets Madras vegetable wax, were bought in at 40 Shillings.

Same journal 2nd page, 1351 baskets of Madras vegetable wax per "*Triumph*" to be sold on Friday 29th January 1858 at the Baltic sale rooms.

I refer the Committee to a letter from Mr. B. written on the 26th of June 1858 and to a letter from Messrs. K., dated April 1858.

The horse grease a horrid compound, the product of ebullition of the unhappy omnibus and hackhorses of London and Paris, a black, soft, fetid grease, never sells in London or Paris under £ 32 per ton, should my vegetable wax never reach a higher level in the markets of England and France, it would yet afford a very ample remuneration to the manufacturer, and it must be borne in mind that it is altogether a new produce, a new culture, and that the revenue, the ryot, the carrier, the Custom House, the boat man, the sailor, have already had an ample share in the benefits offered by the new branch of commerce introduced by me.

Process for re-converting vegetable wax into oil. The vegetable wax should be melted with water at a gentle heat, (not to make it boil) ; when the wax is melted it must be drawn from above the water by a syphon or a cock and put into a large vat, at the bottom of which there is a layer, of bisulphate of potash swimming in a sufficient quantity of

sulphuric acid, so as to prevent the oil coming in contact with the bisulphate of potash.

The room where the vat is, must be kept for 24 hours at a heat of 140° by means of a stove, the heat should be then gradually decreased to 120° and 100° and in four days the oil will be perfectly liquid and will congeal no more.

NOTE.—I am certain that I can prove every fact proposed by me in this document.

MADRAS 27th August 1858. (Signed) ED. LOARER.

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*Extract from the Minutes of Consultation, in the Public Department, dated 13th October 1858, No. 1271.*

The report submitted by the Committee is very favorable to Mr. Loarer's proposition, by which he offers, on payment of a sum of money to be hereafter settled, to place at the entire disposal of Government, for application by the people of the country and the officials of Government within the Districts of this Presidency, a full practical knowledge of the mode he has discovered of converting the abundant common Castor and similar oils into a solid substance resembling, and named by Mr. Loarer, "Vegetable Wax."

2. The Committee state that having obtained through Surgeon Mayer and his Chemical Assistant Mr. Norton information as to the several processes and Chemical ingredients employed for the preparation of the different specimens according to the published Chemical accounts, they then requested Mr. Loarer to exhibit his processes on such a scale as would enable them to judge of the merits of his process as regards *simplicity, economy and efficiency*, and that the experiments made on Mr. Loarer's plan, in their presence, were entirely successful.

3. The Committee also furnish a comparative calculation of the cost of manufacturing the Vegetable Wax, from which it appears that Mr. Loarer's process is of a far more economical nature than that described in Chemical Works. By

the experiments by Mr. Norton, the cost for one ton is Rupees 112-1-6 ; while by Mr. Loarer's process No. 1, it is Rupees 4-4, and by process No. 2, only Rupees 1-11-3 per ton.

4. The Government observe that the value of the discovery depends on its really proving the means of increasing the export of one of the commonest articles of indigenous produce which at present does not find its way into foreign markets on account of the form in which it is prepared, not enabling it to bear the cost of transport. The demand for Wax and Stearine in Europe is so large and so permanent, that the Governor in Council has no doubt this Vegetable Wax will command an extensive sale.

5. The Committee recommend the immediate payment of Rupees (5,000) five thousand to Mr. Loarer, and that a further sum of Rupees (5,000) five thousand be paid on 500 tons of Vegetable Wax being exported, with the proviso, that Mr. Loarer shall *thoroughly* instruct in his process such persons as the Government shall appoint, suitable localities. Government paying Mr. Loarer's travelling expenses when requisite at the rate of eight Annas per mile. They recommend further than if at any time within 20 years (5,000) five thousand tons of Castor or other oil in a solidified form in any year be exported from the ports of Madras, an additional sum of Rupees (5,000) five thousand be granted to Mr. Loarer or his heirs,

6. The Committee observe that Mr. Loarer's offer only applies to the 22 Districts of this Presidency ; but in case Government accept the offer, they think it should be agreed that the Madras Government Establishments wherever stationed, whether beyond sea or otherwise should have the right of using the process for producing such quantity of Vegetable Wax as may be required for their own bonâfide use.

By an exact knowledge of the banks of a river, the army acting offensively, learns what places are susceptible of becoming points of passage, and that acting defensively, learns which points must be more particularly guarded; both should attentively study those most favorable on either side for the defence or passage of the river.

It is not until an accurate reconnoissance of a river has been made, that the most favorable spot, and the best means to be employed in crossing, can be ascertained.

Before crossing a river, it must be observed whether the bank occupied commands that opposite, and if it admits of the establishment of batteries to keep the enemy at a distance, and cover the passage: also, whether the ground on the other side will contain a sufficient number of troops to make an advantageous resistance in the event of the attack being made before all the forces have crossed the river.

As rivers are sometimes bordered by woods, villages, country seats, or other places in their vicinity, which give great facilities for passing them, it is always essential to have a knowledge of these, whether active operations are about to be carried on, or quarters to be taken up.

In either case, the numbers and dimensions of the boats or barges to be met with should be ascertained, in order to know how many men and horses might, in case of necessity, be sent over at once, and how many of these boats would be required in the construction of one or more bridges.

Rivers which, in their courses, form frequent bends, are more easily crossed, than those flowing in straight lines.

The bends of a river require more particular attention than any other parts of its course, because they are of use in planning a surprise, which is generally the best mode of effecting a passage; but it is necessary to be well acquainted with both banks.

The first thing to be examined is the position which the army ought to occupy while the bridges are in course of construction, ascertaining in how many columns this position can be reached; all the outlets from it to the approaches of the bridges ought to be perfectly practicable.

This shows the necessity of an accurate acquaintance with the nature of the ground on both banks, and especially on that occupied by the enemy: firstly, in order to reach the bridge without danger or confusion; and, secondly, in order to push on, as quickly as possible, to the position determined on; this can be effected only when routes have been prepared beforehand, of the directions which the several columns must follow on both sides; and the utility of this precaution will be still more apparent, should it be necessary to follow the river banks.

The different positions should be reconnoitred which the ground may contain in a parallel direction, as well as at right angles to the banks of the river on either side; so that the roads leading to it must be known, as well as the heights, the hills, and their undulations, and their distances one from another.

Should the river be bordered by high or steep mountains, it is useful to know whether, on their slopes, or at their feet, there may be any unfrequented roads or paths used by the boatmen, of which advantage may be taken.

It is always dangerous to attempt a passage opposite a height, a wood, or a close country, when these are occupied, for the enemy might take post there, conceal his movements, and prevent the landing.

As a general rule, a command of fire from the opposite heights is to be avoided whether the passage of the river is to be forced or prevented. If this inconvenience cannot be entirely avoided, the enterprise need not, on that account, be abandoned, but the troops should be kept at a greater distance, as well as the entrenchments, which should be thrown up in

such a manner, as to be exposed to the smallest possible amount of injury from the enemy's fire.

Preparations for the passage of a river may be made before hand, above the point selected for the bridge, particularly when any tributary stream gives a facility for so doing.

Such preparations are attended with the following advantages: 1st. The actual spot determined on for the passage is concealed from the enemy; 2nd. He is left in uncertainty with regard to the exact time of making the attempt, of which the inevitable noise attending the preparation of the beams, &c., would have given him notice; 3rd. The actual construction of the bridge will be much facilitated—this is always a tedious operation, more especially when all the preparations must be made on the spot where the bridge is to be established.

A river may be considered capable of being well defended when the enemy cannot pass it with facility, either in front of the position occupied, nor yet below nor above it, and when he can still less turn it, by ascending to the source.

In reconnoitring a river, which is to serve as a line of defence, attention should be given to the best means of rendering useless any advantages the adversary may derive from the local features of the ground; the facilities he may have of effecting a passage should be examined, whether by existing bridges or by those he may construct, either at the bends, or in other rivers or navigable streams; or else by means of the boats he may be able to collect.

The advantages of the bank he occupies must be observed, as well as the nature of the country he would have to traverse, after having effected a passage.

The best means of guarding any river, which is to be kept as a line of defence, must be studied; the position to be taken up by an army in order to protect the greatest possible extent of its course, and to be able to reach promptly any



particular point ; also the facilities for charging the enemy before all his forces have passed over.

When the passage of a river will occupy a considerable time, the enemy cannot, on the day of the passage, move far from the bank ; it should then be taken into consideration whether his position will be good or the reverse, and whether he may there be attacked with advantage. .

The best modes of obstructing the passage of a river consist, in throwing up redoubts or simple batteries, at the re-entering bends, angles, or other points where the enemy might construct his bridges with facility ; and keeping in good order the roads which the patrols between the different posts have to follow ; these should be as near the bank as possible.

With respect to the posts of infantry, they should be established beyond the fire of the enemy's patrols, at about a hundred paces from the bank, in villages, woods, houses, behind hedges, or other places, whence they may best observe the course of the river and the opposite bank, but sentries should be placed only on that side which is occupied. If the bank is flat and bare, some cavalry picquets should be posted on the heights nearest the river, to support the infantry.

We will now point out what local objects deserve more particularly to be taken into consideration, with reference to a line of defence formed by a great river ; these are :

1st. Those villages on the banks, whence may be observed the movements of the army about to attempt the passage, and those amongst them from which signals may be made to other important points ; in this case, the best signals to be employed by day and by night should be determined on.

2nd. Those parts of the river most favorable for the passage, and the most efficacious means of opposing it.

3rd. The sand banks, islands, different branches of the river, and local peculiarities of the bank occupied, and the modes by which they may best be turned to account in the defence.

4th. The positions of the actual entrenchments, redoubts, and guard houses, or of those about to be established; noting whether any of the advantages of the former are affected by the changes which may have taken place on either bank.

5th. The positions of the fortified posts and their armament.

6th. The different descriptions of work required, and the amount of time which the necessary constructions would demand.

7th. The woods covering those parts of the bank where the army may be; whether they are extensive, dense, or easy of access; what outlets they may have on the banks of the river; if advantageous, or the reverse; and, in case of surprise, whether troops might not be promptly and advantageously retrenched there by means of abattis.

8th. The bank occupied; observing whether it is protected by any marshy parts, and if so, their situation and extent.

9th. The roads following the course of the river or leading to it; noting whether they are practicable for troops and artillery, and with what important points they communicate.

10th. The harbours or creeks that the bank occupied may contain, which might give facilities for the construction of boats, &c; and the resources which may be made available under that head.

11th. The navigation of the river; noting whether it is interrupted during the floods; what causes produce them, and at what periods they occasion inundations; what is their duration and extent; and, lastly, what is in these cases the mean rise of the water, &c.

The direction of the course of a river, the nature of its bank and its local features, must be considered under every possible point of view, when acting either on the offensive or defensive, for the operations of a campaign may sometimes depend on the means used to effect the passage of a river, or to prevent it. This is why it is equally essential to have information respecting both banks of the rivers to be passed or guarded, and of the large streams which run into them, especially when they are navigable, and then more particularly from that point where they commence to be so.

In making the reconnoissance of a river, the following points must also be taken into consideration, and carefully observed.

1st. The country where the river takes its rise, and those which it traverses from its source to its embouchure; the state to which it belongs; noting whether to a neutral power, to one favorably disposed, or the reverse.

2nd. Whether the river is navigable, and to and from what points; whether it is possible to ascend the stream; if it can furnish many, or but few boats; their size and description must be specified, as well as the nature of the navigation and commerce in which they are employed; what advantages may be derived from these boats; the number of infantry and cavalry they can hold, and their tonnage; also the time that would be requisite to assemble them all, at one or at different points; lastly, what they could carry, when the waters are low, and what, when high; whether there are towing paths fit for horses or for men; the places where these are interrupted by ditches, marshes, woods, &c.; towards which side the current runs; under which of the arches of the bridges the boats or rafts should pass; the width of these arches; whether the bottom of the river is sandy, and subject to changes, which might alter the course of the current.

3rd. The width, rapidity, and depth of the river at different distances from the banks when the waters are high as well as low, especially in those places where the passage is practicable: the nature of the bed of the river; whether it is muddy, hard, stony, sandy, or covered with gravel; the bends and windings it contains; if the waters are subject to periodical or accidental floods; if these may be caused by storms, or by sluices and flood gates; what extent of country they can inundate; how long the waters take to run down, and what is their effect.

4th. Whether the river freezes wholly or partially, and at what period; if the ice will support horses, carriages, and artillery; by what means may all surprises be best avoided.

What is the usual period of the breaking up of the ice, and how are its dangers to be obviated.

5th. The sand banks and islands of the river, their configuration, whether they are steep, inhabited, and cultivated, containing heights, woods, downs, or marshes; whether they could be occupied as positions; if they contain mills or sluices, these should be mentioned, and their uses carefully described.

6th. The fords of the rivers, whether for infantry or cavalry; their nature, and any peculiar marks on the banks, by which they may be found; by what means they may be rendered useless; whether the river may become fordable by having a portion of its waters turned off, &c.

It may be observed that fords, to be fit for the passage of infantry, should not be more than three feet deep, and four feet for cavalry; the former, may, however, if absolutely necessary, cross over a ford four feet deep—but then the breadth should not be great.

The best mode of discovering the fords is by going down the river in a boat with a sounding line three or four feet

long, according as it may be desired, to find fords for cavalry or infantry; these will be shewn by the motions of the line.

When a river rushes rapidly between two sand banks, it should be sounded across, as it is generally fordable in such cases.

Fords are often found where the bed of the river is widest—absence of rapidity in the current is often a sign of depth.

Should the river have increased or diminished in depth it ought to be sounded anew, to make sure that its bed has not been hollowed out, and that the same fords still exist.

The best fords have a gravelly bottom; in mountainous countries they are often obstructed by large stones, which render them inconvenient for horses, and impracticable for carriages.

In countries abounding in sandy wastes, the bottom of the fords is generally of fine sand or gravel, which becomes loosened when a number of horses pass through it; the water carries this off, the ford becomes hollowed out, and the last horses have to swim, or get over with difficulty.

When troops have to cross a river, the direction of the ford should be pointed out by stakes, in two rows, showing its width, and the actual position of the passage.

7th. When there are bridges, their situation, uses, and communications must be observed; whether or not they are draw-bridges; whether of wood or stone, in good or bad condition; whether they should be destroyed or rebuilt, and how long these operations would take—the number of their piles, their dimensions and strength; what weight they are capable of supporting; whether they are strong enough for the passage of artillery, waggons, and cavalry, or of infantry alone; the nature of their approaches and outlets, and of the country beyond, whether the banks they unite are of equal height, and, if not, which has the command.

8th. It must be observed whether it would be easy and useful to retrench any of the bridge heads; what advantages might be derived therefrom; whether the bridges could be attacked, if already in the enemy's possession, or defended, should he attempt to make himself master of them, or if it would be better, in the latter case, to abandon, or destroy them.

9th. Notes must be made of the description of bridges it would be possible to establish, such as bridges of boats, of trestles, of rafts, piles, pontoons &c.; which of these would be the best and most easily constructed, with regard to circumstances, the nature of the ground, the width and the banks of the river, the quantity of boats, pontoons, trestles, beams, planks, &c., necessary for their construction.

10th. It must be ascertained whether there are any known passages; what means there may be of constructing, not only bridges of boats, but of casks and beams, &c.; lastly, if there are any flying bridges or ferry boats on the river, and what use could be made of them to pass over waggons, guns and cavalry, or infantry only.

11th. The nature and height of the banks of the river must be noted; their elevation above the water level; their sides; whether the slopes can be lessened; which side has the command; what facilities there are for approaching it; and which are the points where the passage could best be attempted by main force.

12th. The posts on the banks of the river should be observed; the nature of the heights, undulations, woods, hedges, brushwood, cultivated lands, meadows, or marshes, in their neighbourhood; their distances from the banks, those places where works may be undertaken (either by means of sluiceways, or by piercing the dykes) to make inundations capable of covering a position, or with any other object. It must also equally be taken into account whether these inundations can be turned off or allowed to

run down, and whether, by damming back the water, the depth of the river can be effected, rendering it fordable, or the reverse: the means of effecting this should be pointed out.

13th. It is also necessary to consider the fortified places on the river, the strength of their works, the nature and number of their garrisons, of their armaments and provisions; the unfortified towns and villages, the resources they are capable of affording the army; the boats, wood, cordage, and other materials for bridges, which may be collected in a short time, on each point favorable for a passage; what wood there may be fit for the construction of rafts, whether it is floating, or in depots on the banks, or standing; the wind and water mills; the woodcutters or carpenters, the smiths, and the boatmen living on the banks; the mills and sluices, their object, and the use that may be made of them.

To render the reconnoissance of a river complete, those rivers and streams which it receives should also be examined, particularly when these last are navigable, and when the passage is to be attempted below their confluence; it is equally necessary to point out what may be accomplished by their means, to note the distance of the point of confluence from the places where the bridges would probably be constructed, as well as the roads and paths leading to those places.

The bridges which armies are obliged to construct, in order to pass the rivers which are frequently met with in the direction of their lines of operation, should be placed as much as possible, in those spots where they cannot be enfiladed by the enemy's artillery, and where the country opposite their outlets is open, so that these may not lead to marshes, ravines, or mountains.

When the bank opposite that on which the construction of a bridge is commenced is covered with woods, hedges, or bushes, and is commanded by the latter, with nothing to

intercept the fire of artillery, it should not be considered a disadvantage for these woods and hedges, lined by the infantry, who ought to occupy the side to which the passage is to be made, are in favor of the construction of the bridge.

But the ground on which the troops are to debouch should not be too much intersected with marshes and woods, and the wooded part should not extend too far beyond the bridge, or the passage would be difficult, as the enemy would be enabled to harrass, and even to cut off the first troops sent over.

The point selected for the construction of a bridge should be at the re-entering bend of a river, observing to diminish, if possible, the steepness of the sides, or to make ramps, and should there be more than six feet from the water to the top of the bank, some other spot should be sought for.

The more the batteries on each side of the bend are placed in front of it, the greater the distance at which the enemy will be kept; but these batteries, must be so placed, as not to be exposed to be enfiladed by the enemy's guns.

Should the river contain no bends, that point of the bank should be chosen which has the greatest command of the opposite side; and if both banks are of equal height, that part should be preferred where the opposite bank is most open, and exposed to the fire of artillery.

When the embouchure of any river or large stream is on the bank occupied, and above the point selected for the construction of a bridge, advantage should be taken thereof to launch the boats, several of which may be attached together, and the beams laid across them; by this means it becomes easy to float these different parts of the bridge to their proper places, when they have only to be fastened together and moored.

We may observe that bridges should not be constructed close below the confluence of tributary streams, when these run through the enemy's country, as he might float down



heavy bodies in order to break them, and this would be the more easily accomplished, in proportion to the strength of the current.

The most favorable time for the passage of rivers by main force, is, at day-break, because all the preparations may be made during the night, without the enemy's knowledge; and again, because a whole day is then available to secure possession of the opposite bank.

When troops have to pass a river in boats, too many men should not be allowed to enter each boat, so that the pontonniers placed in the bows and stern, may have room to manage their oars and the helm.

The embarkation should be conducted with the utmost order. The first soldiers who embark should sit down on the gunnel, or lean against the sides of the boat, should the gunnel be too high; the remainder will stand. If the water is shallow near the bank, the boats should be kept off a little, and the men may, if necessary, make a few steps in the water, to reach them.

The most perfect silence should be preserved, and the men must be warned not to rush to the side opposite that to which the boat inclines, in case of running foul of anything.

Except in cases of absolute necessity, the troops should never fire until disembarked.

The construction of a bridge should never be commenced until possession is gained of the opposite bank, or the enemy is driven from it.

It is advisable to throw several bridges at once across a river, and at some little distance from each other, so that the passage may be the more quickly effected, and no danger incurred of the communication being interrupted by the enemy, when the army or one of its divisions only has passed over.

In this chapter has been shown, what is most worthy of being taken into consideration by officers charged with the reconnoissance of a river, either with the view of defending the passage, or of offensive operations; the mode of conducting the passage of a river by main force, has also been shewn, as well as the most favorable points for effecting it, and those which present the best chances of success.

It should, however, be observed, that in operations of this nature, as the circumstances admit of an infinite variety, and may consequently give rise to a vast number of different combinations, it is impossible to lay down positive rules for their execution, which shall be applicable in all cases.

What may be suited to one river in a certain season, may be quite impossible elsewhere, or at another time of year:— In one place everything necessary may be conveyed by water; in another, the transport must be effected by land, and even by men: one river has marshy banks, a muddy bottom, and ordinary current; another, a rapid and torrent-like stream, the banks lined with thick woods, and an uneven bottom, covered with rocks and banks of gravel: in short, as nothing can be more varied than these accidents of nature which render the preparations for such enterprises liable to constant change and modification, it is only by an attentive study of detailed accounts of operations of this description, that officers can find fit subjects for meditation, by which they may be guided, and have their “*coup d’œil*” improved.

The advantages to be derived from accounts of these operations, are not confined to those officers, who, from their position, may be called on to direct similar ones; there is no soldier who may not find in them, useful examples and suggestions on which he may reflect with profit.

### 13. *On False Attacks and Demonstrations.*

Demonstrations and false attacks are made for the purpose of deceiving the enemy, and of inducing him to take false

steps—when skilfully executed, they contribute essentially to the success of military operations.

By demonstrations are meant those movements and preparations, of which the object is, to lead the enemy into error with respect to the operations to be undertaken; the same is meant by false attacks, with this exception, that these are always attended with an engagement more or less serious.

Demonstrations are as varied as the objects which lead to their employment.

Those of which the object is to deceive the enemy, with regard to the plan of operations of the campaign, are more particularly based, 1st. On the distribution of the army in its quarters or cantonments; 2nd. On the movements made by the Troops; 3rd. On the establishment of the magazines; 4th. On the state of the roads; 5th. On the positions occupied and fortified &c. &c.

Demonstrations of minor importance may be made with simple detachments, or with small bodies of troops, their object is generally, 1st. To threaten the enemy on a particular point, in order to induce him to support it, and thus make him disseminate his forces; 2nd. To deceive him as to the point of the real attack, reaching it either by means of rapid manœuvres, or by taking advantage of the ground to conceal the movements, whilst feigned attacks are employed to keep the greater portion of the enemy's forces at a distance from the decisive point, &c.

Demonstrations of enterprises, which may be considered impossible, should never be made.

For instance, if it is intended to cross a river at a point selected for that purpose, and it is wished to keep the enemy at a distance, the demonstrations or false attacks, made with that view, should be directed on points, which would be considered both in strategy and tactics, as suitable for the passage; were they not so, the enemy would not be deceived,

and disregarding the demonstrations and false attacks, would remain at his post,

In order to derive every possible advantage from demonstrations, the necessary movements and preparations should be made with every precaution, so as to give them the appearance of a serious enterprise,

The troops employed should be left in ignorance of their destination, or they might act with a want of energy, which would alone suffice to give the enemy an idea of their real object.

It is desirable to be well acquainted with the character of the officer commanding the enemy's troops; for one officer may be led into a snare by concealing the real intention, whilst another may be easily deceived by openly taking measures for the execution of an enterprise, more especially when, after having been several times taken in, he is induced to look upon these measures as merely "*ruses de guerre*."

What has been said about demonstrations, applies equally to false attacks; but, it is useless to employ these last against positions so strong that the enemy does not fear to leave them to themselves, or against points of which the loss would be unimportant.

Whenever a false attack is undertaken, with the view of withdrawing the adversary's forces from the decisive point, it must precede the true one, and should be directed against a point sufficiently distant, to prevent the troops sent there from countermarching, and returning to the assistance of those defending the point really attacked.

The interval of time, and the distance to be observed between the false and real attack, must be determined with regard to the numerical force of the enemy, the description of troops at his disposal, the nature of the ground, and the amount of resistance he is considered capable of making.

False attacks are often made with the view of making offensive or retrograde movements, or of concealing the strength or weakness of one's own forces; whatever may be the motive, they should always be made with a sufficient number of troops, and with every appearance of an enterprise seriously undertaken.

Although the troops employed in false attacks, should be left in ignorance as to the object of their movements, it is not so with the Officer commanding them, because he should take his measures, in such a manner as to expose to the efforts of the enemy, no more men than may be indispensably necessary, except in very particular cases, and his reserve should be the strongest part, so that he may be able to direct the combat, keeping it up, or putting an end to it, as he may consider most desirable.

When by demonstrations, the same result may be attained as by false attacks, the former are to be preferred, so as not to expose the men more than necessary.

Should it happen that an officer, entrusted with the command in a false attack, gains possession of a point it was only intended to menace, he must at once refer to the officer commanding the whole, who should alone decide whether or not it may be held with advantage.

In order to frustrate the demonstrations and false attacks of the enemy, all those operations, which it is in his power to attempt, and those which would be most advantageous to him, should be taken into consideration; he will either be guided by correct principles, or he will deviate from them.

In either case prudence enjoins us, 1st. Never to abandon the strategical points of the position, nor to weaken ourselves there with the view of meeting the enemy on other points of less importance, even were he to direct a portion of his forces on the latter; 2nd. Not to resolve on any step without having first obtained certain information respecting the direction and strength of the enemy, even at a sacrifice of

time, for this may easily be made good, and at all events, would be less dangerous than the abandonment of an important position.

The officers who are entrusted with the direction of demonstrations and false attacks, often find occasions which call forth all their abilities and enable them to contribute effectually to the success of the principal operations.

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#### 14. *On Corps of Observation, and on Investing and Blockading Corps.*

The conquest of a fortress requires, as a necessary condition, that the enemy be unable to afford assistance from any quarter. The investment should be complete, so as to render it impossible for the smallest detachments to penetrate, as they would retard the fall of the place, either by introducing provisions and ammunitions of war, or by facilitating the means of procuring them by sorties.

In order to fulfil this indispensable condition, when a fortified place is to be reduced, it should first be surrounded by a line of troops, facing inwards, whilst another, an outer line, facing the other way, watches the approaches from the surrounding country. But, as by this means, the forces would be too scattered, and the power of repulsing the enemy at any point where he might try to penetrate, would be lost, the exterior circle should be occupied by a chain of posts only, the corps of observation holding a central position, ready to move whenever it may be required.

Should the place be situated on a river, this precaution becomes the more necessary, because the basins of rivers are generally flanked by heights parallel to their course, and often close to them; so that the troops would otherwise be scattered over the broken declivities of the mountain; and again, the communications would be subject to so many delays, that it would be impossible for the different posts to afford each other assistance. The safety of the corps of

observation might there be compromised, were a single post forced.

These maxims are more easily followed when the direction of the operations, the local features, or other circumstances, indicate the lines on which alone the enemy can advance; or again, when the place is situated on the banks of a river, because it is then sufficient to observe the side on which the enemy may be, and to watch, at most, one-half of the circumference.

The development of the exterior circle, and the distance to which the corps of observation should go, depend on the object in view, and on the general principle, that every enterprise should be founded on the security of the retreat, and of the base of operation; from these considerations, it may also be deduced, whether a siege should be undertaken or if the operations should be limited to a blockade.

Should a simple investment be decided on, and the main object be to prevent the entrance of convoys, it is only necessary to calculate the time required to retire without danger, in case the corps covering the blockade should be beaten, or should wish to avoid a combat. But to protect a siege regularly, the posts should be more extended, and a larger space be kept between the place and the enemy, because it requires more time to save the "materiel" of a siege, and the inferiority of the disposable forces destined to act against the enemy, may be compensated for by the distance at which he is kept.

It is different when an army encounters on its line of operations fortified towns of the enemy, which it is not thought fit to besiege. These should either be observed to prevent their garrisons from annoying the communications, or should be blockaded, so as to confine them to their own stores of provisions, and thus hasten their reduction.

From this simple explanation it may be seen that the principal object of a corps of observation, is to oppose any enterprise that a garrison might attempt, either alone, or in concert with others in its vicinity, or with the inhabitants of the country invaded; whilst the object of a blockading corps is to force a garrison, abandoned to itself, to depend on its own resources.

A corps charged with the blockade of a place, should be numerically stronger than one charged to observe it, although the officer commanding the latter, should not confine himself to a mere observation of the garrison, but should also make use of every means in his power, to restrict it to the narrowest possible limits, and should take particular care that the reinforcements, munitions of war, and provisions sent to the place, are not allowed to reach it, thus restricting the garrison to its own resources; and should the artillery at his disposition admit of it, the place should be bombarded.

The strength and composition of a blockading corps, or of a corps of observation, are determined, 1st. By the consideration of the strength and composition of the forces in the garrison; 2nd. By the development of the fortifications of the places, by the nature of the ground on which these places are situated, and by which they are surrounded.

As in many other cases, we can here give only general principles; for each new circumstance requires such changes and modifications, that the strength and composition of blockading and observing corps cannot be decided on until the country and ground on which they are to act have been reconnoitred, and until the composition, strength and situations of the garrisons, have been approximatively ascertained.

When fortified places are situated on considerable heights, and are surrounded with high mountains, their garrisons being generally very weak, it is better to blockade than merely to observe them; but, when they are situated on flat ground,



and in an open country, without obstructions, it is more advisable to observe them.

Generally speaking, two-thirds of a corps, which has to observe a place situated in a plain, should consist of cavalry, the remainder being infantry, the whole strength being one-third more than that of the garrison; if, on the other hand, the ground in the environs of the place be much broken, two-thirds of the corps of observation should consist of infantry, and the remainder of cavalry, the whole being half as strong again as the garrison.

A corps charged with the blockade of a place, should consist entirely of infantry, and should equal the garrison in numbers.

The officers entrusted with the command of a corps of observation, should commence by acquiring a perfect knowledge of the nature of the ground, on which the places they are to observe, are situated; and these corps being left to themselves, and at a distance from the main body, should take the greatest precautions for their safety, and choose such positions as may enable them to effect their retreat should it be necessary, without committing themselves.

Detachments, composed principally of cavalry, should be sent from the position taken up by the corps of observation, to take post at given points about the place, so as to be able to oppose a vigorous resistance to the troops of the garrison, on whatever side they may make their sorties.

Each of these cavalry detachments should be at least equal in strength to the cavalry of the garrison, and they should be so disposed, as to be able to unite promptly and with facility, in order to form a body capable of arresting the enemy sufficiently long, to allow of the main body coming to their support, in case of their being hard pressed.

The main body, as well as the detachments, should have posts not only on the side towards the place, but on every

point by which the enemy might reach them so as to be prepared for every enterprise that the garrison, as well as the troops outside, might attempt.

During the day, the posts established by the detachments for their security, should be distant about a cannon shot from the place, whilst during the night they may approach to within musquet shot.

The sorties undertaken by a garrison against the posts of a corps of observation, have usually the following objects more particularly in view, 1st. To receive or give intelligence, especially when those posts are so numerous and vigilant, that there is no mode of attaining that object but by driving them back; 2nd. To procure the provisions and resources to be found in the environs; 3rd. To effect a junction with the inhabitants of the country, or with some other garrison, or with a body of troops, sent expressly to execute some enterprise in the open country; 4th. To second any efforts that may be made to raise the siege, or to supply the garrison with provisions, stores, or reinforcements.

A garrison should never make sorties merely with the view of driving back the post of a corps of observation, for these do not immediately annoy it, and even if driven back, would soon re-occupy the same ground, so that the garrison would be uselessly subjected to fatigue and loss of men.

From whatever motive the garrison may attempt a sortie, the corps of observation should never engage seriously on ground commanded by the fire of the place.

The intencion of the enemy may be easily guessed from the manner in which the sortie is conducted.

If, for instance, a weak detachment sallies from a garrison, and contents itself with forcing a passage through the surrounding posts, it may be presumed that the object in view, is merely to give and receive intelligence. Such an object

may be easily frustrated by means of detached parties constantly patrolling round the place.

Should the detachment sallying forth be stronger, and take with them beasts of burden, and means of carriage, it is evidently their intention to collect provisions; the best thing the corps of observation can do to render useless sorties of this nature is, to destroy or carry away everything within a league of the place, which might be of use to the garrison.

If the troops employed in the sortie are numerous; if they are accompanied with artillery or much baggage, with wagons, &c., it is a proof that they intend abandoning the place entirely, either with the view of joining some other garrison, or of uniting with the inhabitants of the country to attempt some enterprise in the open plain.

In this last case, the officer commanding the corps of observation, should at once assemble his whole force, pursue the troops which have left the place, and attack them vigorously, as soon as he considers that they are too far to receive assistance, taking care to prevent their returning; in short, he should endeavour to destroy them altogether, or to take them prisoners, for, were he merely to disperse them, they might nevertheless execute their project, especially if the officer commanding them were commissioned to excite the peasantry to take up arms, and to put himself at their head.

Should the corps of observation be too weak to venture an attack, with any prospect of success, upon the troops making the sortie; or should the ground be unfavorable, its commander must endeavour to retard the march of the enemy by destroying the bridges and roads, by making demonstrations of attacking him, and by every other means in his power; and should follow him until the real object of the sortie is ascertained, even though he may be unable to frustrate it.

Whenever an officer commanding a corps of observation, learns that a hostile force is approaching the place, and remarks at the same time that the garrison is making prepara-

tions which shew that they purpose attempting a sortie, he should advance to meet the enemy, and attack him without hesitation. Should this body be superior to his, he must immediately retire to avoid being attacked simultaneously by the garrison.

When a corps is charged with the observation of two places, at short distances from each other, the commander takes post between them, and should their garrisons, with the design of uniting, execute sorties at the same time, he should march against the nearest first, and endeavour to beat it before the other can arrive to take part in the combat. So much for corps of observation; now for blockading corps.

Blockading corps, the object of which has been already explained, should invest a place as closely as possible, and no part whatever of their forces should be suffered to leave it, lest the garrison, taking advantage of their absence, should introduce supplies.

The officer commanding a blockading corps, should throw up redoubts on the points best calculated for repulsing the sorties that may be made by the garrison; these redoubts, supported by strong detachments, should not be too large, because their defence would require too many men, but they should be well constructed, and mounted with heavy guns, so as to be able to resist an attack until the arrival of the supports; moreover, they should not be exposed to the fire of the artillery of the place, which would soon destroy them, and annoy the troops charged with their occupation and defence.

In order more completely to hem in the garrison, and annoy it up to the covered way, ditches may be dug in the night, in front of the redoubt, when the nature of the ground admits of so doing, these should be occupied by sharpshooters selected from the best marksmen.

To the blockade should be added a bombardment when the stores are not kept in casemates, and when the place is

extensive and rich, the dread of its ruin may induce the inhabitants to decide on surrendering it.

The commander of the blockading corps determines the points for the construction of the batteries, from his knowledge of the interior of the place, and of the measures taken by the defenders; the batteries should be sunk, so as to be less exposed to the fire of the artillery of the place, and should be completed in one night.

In order to produce the greatest possible result from these batteries, their artillery should all fire in the same direction, otherwise they would, by a diverging fire, produce but little effect, especially when acting against an extensive place.

Advantage should be taken of the night to bombard a place, as well as to relieve the posts and change the artillery.

The blockade of a place is generally undertaken only when the army is able to support the corps charged with the operation. There are, however, circumstances when this corps is left to its own resources, and should make head against the enemy if he advances, whether with the intention of raising the blockade of the place, or of throwing in supplies.

In such a position, should the commander of the blockade consider himself able to engage the enemy with advantage, he should advance to meet him, without, however, going too far from the place, being careful to leave detachments to defend the entrenchments, as well as a strong reserve to support them, and assist in driving back any sorties that the garrison might attempt.

But, should the numerical forces of the approaching enemy be such, that the commander of the blockading corps would be obliged to oppose him with his entire force, his best mode of proceeding would be to collect his troops without any delay, and retire from the place, in order to prevent the garrison from taking any part in the combat, even were he convinced that the latter would not fail to take advantage of the

blockade being raised to destroy the works, and re-victual the place.

Such are the general principles by which officers, entrusted with the charge of corps of observation and of blockading corps, should regulate their proceedings.

When a place is to be besieged, the investment must first be made.

The cavalry is charged with this operation.

For this purpose it precedes the army, and quickly surrounds the place of which the siege is resolved on, so as to cut all the communications, and intercept the convoys, which the enemy always attempts to introduce at the last moment. The army then comes up with the heavy artillery; the enemy's posts in the advanced works are driven in; and at night fall, the opening of the trenches is commenced, &c; but it does not enter into the plan of this work, nor is it within its limits to treat of operations of this description.

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**On the Molecular constitution of the metals of Ordnance, as affecting its construction and wear in service.—By Robert Mallet, Esq. C. E., F. R. S. &c.**

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Within the limits of a single Lecture it will not be possible to do more than glance at some leading characteristics of a large and important subject, the complete treatment of which requires more than one volume, and which, old as is the art of gun founding, remains yet in great part to be written. I shall confine myself at present, amongst the metals which may be viewed as peculiarly those formative of artillery, namely, cast iron, wrought iron, steel, and bronze, to the three first, reserving for perhaps some future occasion any remarks upon the last, the most compound and complex, and, though the oldest used, perhaps still the least under-

stood material of ordnance. And again, in the remarks I purpose making upon iron in its three remarkable states—cast, wrought, and steel—as materials for ordnance, I propose restricting myself to some views as to the molecular constitution of these metals:—

1st. As influencing the proper form of cast iron guns ;

2nd. As determining the proper construction of guns of wrought iron ;

3rd. As affecting the wear and tear of guns in service—in explanation of the hitherto misunderstood phenomena called “drooping at the muzzle.”

Incidentally, a few remarks may occur with reference to steel and bronze.

I speak in presence of many who upon the well fought field, or before the shattered tower, must have had frequent opportunities of observing guns burst in service, and who will have probably remarked a certain general uniformity of direction in the fractures—a common method, as it were, according to which a gun (if sound) always bursts—but probably also without having attempted either to analyse the condition upon which uniformity under such apparently accidental and capricious circumstances rests, or to follow out to their consequences, as regards the gun itself, the law of such conditions when ascertained. I propose, in the first place, briefly to trace both of these.

The Plate No. 25 shews by the heavy dotted lines the almost invariable directions in which fracture takes place when cast iron guns burst in proof or in service. Assuming no serious flaw or other defect to exist anywhere, the gun splits up nearly into equal halves, usually by a vertical or nearly vertical plane, passing through the axis of the piece, and extending from the breech ring, which it often also divides, longitudinally to a point a little in advance of the trunnions, where it turns out to one side and to the

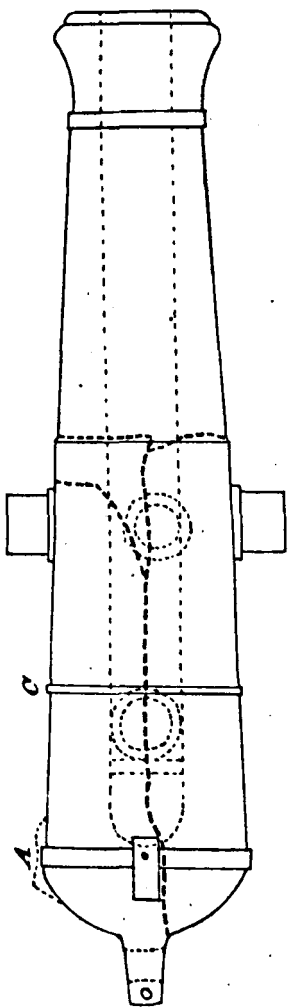


Fig. 1.

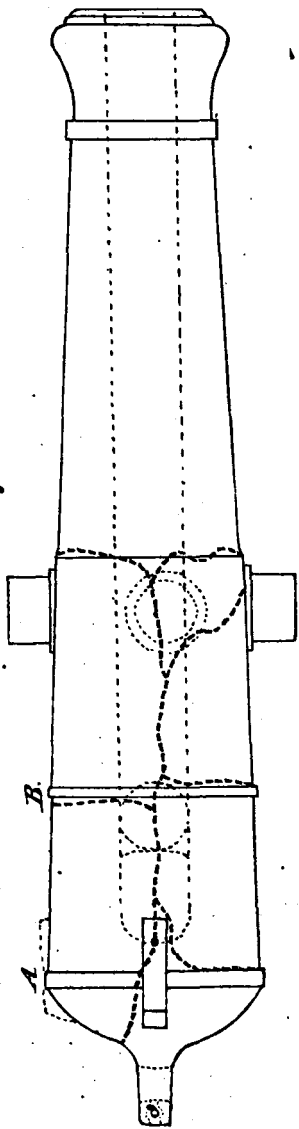
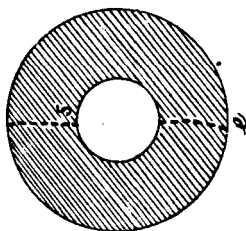
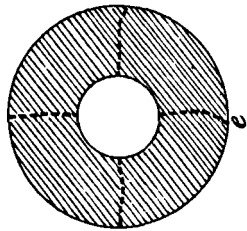
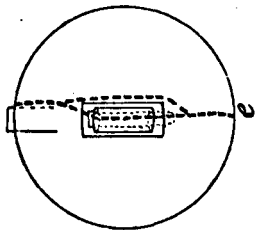


Fig. 3.



other, leaving the muzzle portion of the gun for a length of between two-fifths and one-third its whole length unbroken. This portion of the gun at the moment of fracture is thrown forwards, partly by the direct action of the powder-blast escaping, partly through the unbalanced action of the elastic forces within the strained metal suddenly released, and partly by the friction of the passing-through shot. It usually falls to the ground with the muzzle end foremost, and as this strikes the ground the mass throws a somersault, and is found lying along in the line in which the gun had been trained, but with the direction of the muzzle reversed, or pointing backwards, a circumstance often remarked upon with surprise by artillery officers, but which is thus easily accounted for.

Sometimes the portions of the gun at and in rear of the trunnions are divided by other fractures in planes more or less completely at right angles to the preceding one, and by several "turn out" or transverse fractures. These latter occur and are more numerous in proportion as the metal of the gun is harder, more highly elastic, and more rigid, and as the bursting charge is more powerful—in a word, the fragments are smaller and more numerous, and more irregular, when the rending forces are greatly in excess of the resisting powers of the metal.

The fractures of bronze guns are of a somewhat different character, and the fragments are bent and distorted, both owing to the greater toughness and ductility of the material.

Three circumstances are specially worthy of attention as indicated by the lines of fracture thus generally described:

1st. The dividing longitudinal plane, whether vertical or horizontal, is always found to assume a sudden curved form, as in diagram, at one or other side of the exterior of the gun; indicating that the fracture begins at one side *s*, that opposite to the inflected fracture, and that fracture has spread from that side, the gun opening out and

the divided surfaces turning from each other upon the point of inflection at  $e$ , as the hinge.

2nd. Fracture therefore appears in all cases to commence at the interior of the chase, and to propagate itself outwards, thus rending the metal from within to without; a result which, though difficult at first to reconcile to the imagination, is pointed to by every mathematical investigation of the resistance of cylinders to internal fluid or elastic pressure—leading to whatever formula—since *the metal must yield first when the pressure per square inch is greatest upon its resisting unit of section, and this is in the interior of the thickness.*

3rd. The planes of fracture follow the track, with almost unerring precision, of all re-entering angles, and of all sudden changes of scantling or dimension, however trifling, in the external contour of the gun. Thus a vertical longitudinal fracture often passes through the vent (as being the weakest part in section,) but much more frequently follows along the re-entering angle made along the exterior of the gun at its meeting with one or other side of the vent field, as in fig. 1 and fig. 3. The transverse fractures, though often more or less diagonal to the axis of the gun, also mainly follow round, with remarkable regularity, the small re-entering angles made by the several breech or reinforce mouldings on the exterior of the gun, while those which approach the trunnions usually fall into the re-entering angles made by these with the body of the piece.

No doubt these facts are familiar to every one who hears me, but I am not aware that the value of their correct observation has hitherto been recognized, or that any attempt has been made to assign a cause for them, or, in fact, to attribute the directions into which a burst gun breaks to anything more than "accident".

I proceed to explain the cause. It is a law (though not noticed, so far as I know, by writers on physics,) of the molecular aggregation of crystalline solids, that when their cry-

stals arrange themselves under the influence of heat in motion, these arrange and group themselves with their principal or long axis in lines perpendicular to the cooling or heating surfaces of the solid, that is, in the lines of direction of the motion of the heat, and this is true whether in the case of heat *passing from* a previously fused solid in the act of cooling and crystallizing on consolidation, or of a solid not having a crystalline structure, but capable of assuming one upon its temperature being sufficiently raised by heat applied to its external surfaces, and so *passing into* it.

For example, if an ingot of sulphur, antimony, bismuth, zinc, hard white cast iron, or other crystallizable metal or atomic alloy, or even any binary or other compound salt, or haloid body, as sulphuret of antimony, calomel, salammoniac, various salts of barytes, and lime, chloride of silver or of lead, chromate of lead, or even organic bodies, such as camphor and spermaceti, provided only they be capable of aggregating in a crystalline form under the influence of change of temperature, as from fusion or sublimation—if an ingot or mass of any such body be broken, the principal axes of the crystals will always be found arranged in lines perpendicular to the bounding planes of the mass, that is to say, in the lines of direction in which the wave of heat has passed outwards from the mass in the act of consolidation.

But, conversely, the same effect is found to be produced by the application of heat (far below that of fusion) to the surfaces of solids, which are capable of solidification in either of the two states, homogeneous, (amorphous) or crystalline. Of such bodies many are known. For example—many of the metals, glass, carbon in certain states, ice, chalk, when crystallizing into marble under pressure and ignition, oxide (litharge,) and iodide of lead; and amongst even organic bodies—sugar, paraffino, spermaceti, &c.

If a cylinder of lead of some four or five inches long, and about the same in diameter, be cast around a round bar of

iron of about  $1\frac{1}{2}$  inches diameter, and some two or three feet long, the lead on becoming cold, and rapidly consolidated by the contact of the cold iron bar interiorly, will have a perfectly homogeneous structure; it may be cut into, beaten out, &c., but presents no trace of crystallization.

If, however, one of the projecting extremities of the iron central bar be now placed in a furnace and heated red-hot, and time be given until the heat conducted along the bar, and from it passed into the interior parts of the lead cylinder, and thence transmitted outward radially through the latter in all directions, shall have raised the temperature of the lead itself to within a few degrees of its melting point, say to about  $550^{\circ}$  Fah., and the lead be now struck sharply with a hammer, the whole mass will be found to have assumed internally a crystalline structure; all the principal axes of the long, thin crystals radiating regularly outwards from the axis of the cylinder to its surface, and by a few blows of the hammer the whole mass will separate and fall to pieces as a metallic dust; so complete are the planes of separation of the crystals (See Plate 26 *A*.)

A piece of cylindrical brass wire, tough, fibrous, and presenting no traces of crystallization, may in the same way be caused to become almost instantly brittle and crystalline, if passed endways into the centre of a red-hot iron tube of small diameter (such as a gun barrel,) held vertically.

A flat plate of thick rolled or malleable zinc, which is nearly homogeneous in structure, or, if not so, presents fibres and lamina in the plane of the plate, if laid down flat upon a cast-iron plate, and heated to within a few degrees of its melting point, assumes very soon a crystalline structure, the crystals having their principal axes now all cutting perpendicularly through the plate from side to side; in other words, the internal structure being in this and the former case absolutely turned round  $90^{\circ}$  of angular direction.

Fig: 9.-

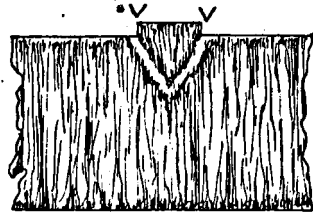


Fig: 7.

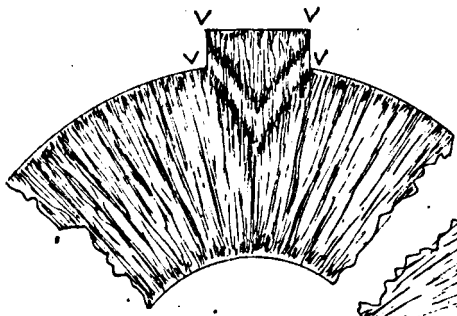
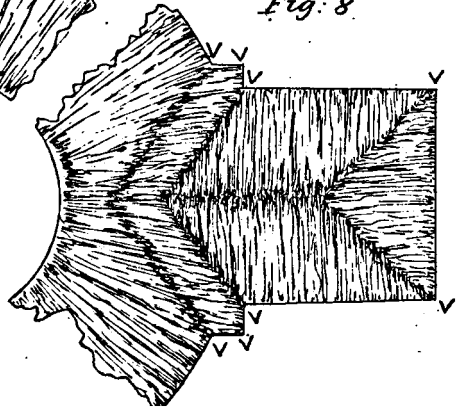


Fig: 8.



The same change of structure takes place more slowly in glass : when exposed for a considerable time to a heat short of fusion, or even complete softening, it is converted into the opaque substance known as Reaumur's porcelain, in which a crystalline structure is developed, and the principal axes are arranged perpendicular to the surfaces recipient of the heat.

Many other instances might be adduced, were this the place to pursue so tempting a subject ; but enough has been given to indicate the generality of the law.

Now cast iron is one of those crystallizing bodies which, in consolidating, obeys, more or less perfectly, according to the conditions, this law also ; so that generally it may be enunciated as a fact, that *in castings of iron the planes of crystallization group themselves perpendicularly to the surfaces of external contour ; that is to say, in the directions in which the heat of the fluid cast iron has passed outwards from the body in cooling and solidifying.*

Because the crystals of cast iron are usually small, and are never very well pronounced, these directions are seldom very apparent to the eye, but they are not the less real.

Their development depends—

1° Upon the character of the cast iron itself ; whether it contain a large quantity of chemically uncombined or suspended graphite or not, which Karsten has shown to be the case with all cast irons that present a coarse, large-grained, sub-crystalline, dark graphitic or shining spangled fracture ;—such irons form, in castings of given size, the largest crystals.

2° Upon the size or mass of the casting, the largest castings presenting, for any given variety of cast iron, the largest and coarsest aggregation of crystals, but by no means the most regular arrangement of them, which depends chiefly upon—

3° The rate at which the mass of the casting has cooled, and the regularity with which heat has been carried off,

by conduction from its surfaces to those of the mould adjacent to them; and hence it is, that of all castings in iron those called "chilled," that is to say, those in which the fluid iron is cast into a nearly cold and very thick mould of cast iron, whose high conducting power rapidly carries off the heat, present the most complete and perfect development of the crystalline structure, perpendicular to the chilled surface of the casting. In such the crystals are often found penetrating  $1\frac{1}{2}$  inch or more into the substance of the metal, clear and well defined.

These prevailing directions of crystalline arrangement may be made more clear to the eye by the Plate 26 *A*.

Figs. 1 and 2 are sections of a round and a square bar of any of the crystalline solids we have spoken of, or of cast iron when the crystallization is well developed (the circumstances affecting which we shall consider further on). In the round bar the crystals all radiate from the centre; in the square bar they are arranged perpendicularly to the four sides, and hence have four lines (in the diagonals of the square), in which the terminal planes of the crystals abut or interlock, and about which the crystallization is always confused and irregular.

In fig. 3 a flat plate is shown in section. The directions of the crystalline axes follow the law of No. 2, with an expansion in one direction.

In fig. 4 a section is shown of the hollow cylinder of lead alluded to (ante, page 767), in which, as in the case of fig. 1, the arrangement of the crystals is always towards the centre or axis of the cylinder. This figure also applies to every cast iron hollow cylinder, whether water-pipe, gun, mortar, &c.

Fig. 5 represents a portion of the lower or closed end of the cylinder of the hydraulic press as first made for the purpose of raising the tubes of the Britannia Bridge, and which broke in the attempt; the end of the cylinder having broken

Fig. 1.

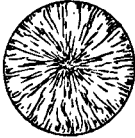


Fig. 2.

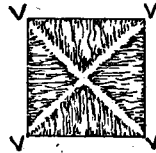


Fig. 3.



Fig. 4.

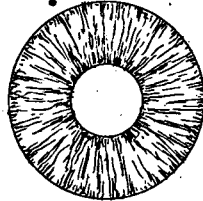


Fig. 5. B.

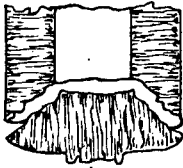


Fig. 5.

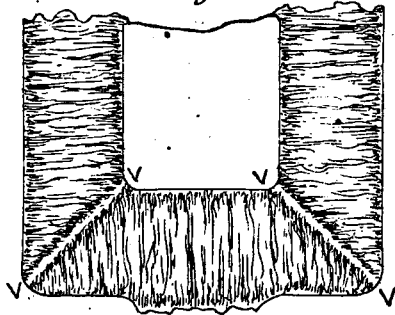
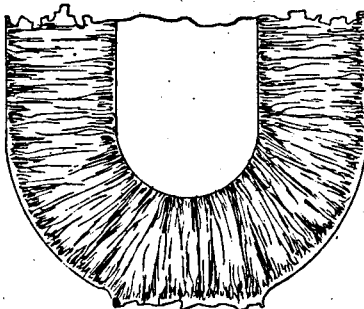


Fig. 6.





out from the sides, in the form of a fracture of a cone, as in fig. 5 B, under the severe water pressure to which it was exposed; that is to say, the fracture took place all round, along the plane of junction of the conterminous crystals, formed perpendicular to the external and internal surfaces of the bottom and of the sides of the cylinder, proving that such planes of junction existed as in figs. 2 and 3. The crystals here join and interlace confusedly; these are *planes of weakness*—planes in which the cohesion of the metal is less, and for this reason, than in any other parts of the mass. These *lines of weakness* extend from V to V throughout all the figures. The form of the bottom of this cylinder was changed by Mr. Stephenson, from a distinct appreciation of the fact, that the fracture of the first was in some way connected with the sharp and sudden termination square to the axis of the cylinder, though without apparently any clear conception of the crystalline laws upon which the fact depended, and a new cylinder, with a sort of hemispherical end, was made, a section of a portion of which is represented in fig. 6. This stood the strain uninjured. Here the principal axes of the crystals all are directed, as in figs. 1 and 4, to the centre. They therefore *gradually* change their direction, and no planes of weakness are produced.

It is to be hoped that these illustrations have served to make clear the general law as applied to cast iron artillery, that *every abrupt change in the form of the exterior, every salient, and every re-entering angle, no matter how small, upon the exterior of the gun or mortar, is attended with an equally sudden change in the arrangement of the crystals of the metal, and that every such change is accompanied with one or more planes of weakness in the mass.*

Figs. 7 and 8 are sections of portions of a large cast iron gun. The former one, of part of the breech through the "vent field" square to the axis of the bore. The latter, a section near a trunnion, also square to the axis. Fig. 9, a

section of a reinforcing ring in the plane of the axis. In all of these are shown, in an exaggerated form, the directions of crystalline aggregation, and the planes of weakness resulting from it.

It will be remarked that the square projection of the "vent field" produces at each salient and re-entering angle planes of weakness, which in the case of the latter angles penetrate deep into the thickness of the gun: and that these planes really do exist, is evidenced by referring back to Plate No. 25 in which it will be seen that the lines of fracture in burst guns almost always follow along the angle at the sides of the "vent field."

So also in the case of the trunnions (fig. 8). On referring back to the same diagram, it will be seen that the great planes of cross fracture usually turn out and meet the exterior of the gun just at the re-entering angle of the trunnion with the body of the gun. A gun, like every other body that fails under strain, must fail in the weakest place. We have shown in what places they do fail, and we have shown, *a priori*, what must be the weakest planes (for a given material and mass), and we have found that the places of fracture and positions of these "planes of weakness" most remarkably coincide. The conclusion therefore seems inevitable, that, however incapable the unaided eye may be to discern any difference in the crystalline arrangement of one part of the gun more than of another, such planes of weakness do exist, in the positions and from the causes here pointed out.

The external forms of cannon have been greatly modified and simplified of late years from the complex and highly ornamented (?) forms of former periods; but even still, in the plainest forms of guns, such as Sir William Congreve's patterns, Monk's &c. mouldings, astragals, reinforces, &c. are still adhered to, and, from unwillingness to give up altogether, antiquated forms, adopted and continued in ignorance, we have the folly still to cling to making numerous sharp

angles and corners, and sudden changes of form and of dimensions, on the exterior of all our ordnance, and so prolong, in the most needless way, one cause of their weakness.

That gun, however plain externally, will look best to the really educated eye that most fully conforms to the laws upon which its perfection as an instrument depends,

Some remarks should now be added as to the effects upon the strength of guns which circumstances, brought into play in the processes of moulding and casting them, exercise, extraneous to those which we have already treated of as respects the directions of aggregation of the crystals of the metal.

Although not my intention to go at all into questions referring properly to the iron-founder's art, to practical methods, better or worse, or to the details upon which sound or defective castings depend, as these, though most important, do not find a fitting place here, it would yet be desirable to consider,—

1. Upon what circumstances the more or less complete homogeneity of the crystalline alloy we call cast iron depends when cast into guns, and therefore how, with the best or with any external form, we may most avoid the formation of "planes of weakness," so far as the moulding and casting are concerned ;

2. The effects due to the contraction of the metal in process of cooling, and of sudden changes of mass or of dimension upon this ;

3. The effects of rapid and of slow cooling, and of unequal cooling ;

4. The effects of casting under the fluid pressure due to increased "head" of molten metal ;  
and to add a few remarks upon the presumed relative advan-

tages so much and so loosely talked of latterly, of cold-blast and hot-blast iron, and of foreign and British iron, as materials for ordnance; these, however, I must pass in a very cursory manner. It is known to every practical iron-founder upon a large scale that generally the larger the mass of the casting he makes with any given quality of cast iron the "*coarser is the grain,*" that is, the larger are the crystals that develop themselves in the mass. The same metal that shall produce a fracture bright gray, matted, and without a crystal visible even to a single lens, when cast into a bar say two inches diameter, shall, if cast into a cylinder of two feet in diameter, produce a dark confusedly crystalline surface of fracture as coarse as granite rock.

To meet this, the practice is to prescribe for material for large castings a certain large proportion or mixture of "small close-grained scrap metal" with the pig iron, of whatever quality may be directed. The remedy fails, as fail that always must which is founded upon a misconception of the laws of the phenomena. As well might small seeds be sown to produce small trees. The small scrap is no sooner cast into the large mass than it assumes the large crystalline grain. Again, by some iron-founders one "make" or sort of pig-iron is presumed to give a closer grain than another, and he prefers it; and although this is to a certain extent true, *i. e.* that some cast irons—that is, some of the innumerable alloys that go under that name—do, under equal conditions, produce rather smaller crystals than others, still this view equally fails to attain the object of *close-grained heavy* castings. But, futhermore, it is a fact familiar to iron-founders, that of several castings of the same form and mass, made at nearly the same time from the same mixture of metal, and melted in the same furnace, some will when cold have a much more coarsely crystalline grain developed in them than others. The fact is familiar, but I am not aware that any attempt has been made on principle to explain it, and hence no means taken to prevent its occurrence.

Now while the *regularity of developement* of the crystals in cast iron depends as we have already seen upon the regularity with which the melted mass cools, and the wave of heat is transmitted from its interior to its surfaces, arranging the crystals in the *lines of least pressure* in its transit, *the extent of developement*, or, what is the same thing, the size of each individual crystal, depends upon the length of time during which the process of crystalline arrangement is going on, that is to say upon the length of time that the casting takes to cool. Hence then it may be announced as a law, that

The size of crystals, or coarseness of grain, in castings of iron, depends, for any given make of iron and given mass of casting, upon—

1st. The high temperature of the fluid iron above that just necessary to its fusion ;

2nd. Upon the time that the molten mass takes to cool down and assume again the solid state.

The conclusion and rule that I deduce from a wide and careful consideration of all the conditions affecting the formation by casting of cast-iron guns is, that

The lower the temperature at which the fluid cast iron is poured into the mould, and the more rapidly the mass can be cooled down to solidification, the closer will be the grain of the metal, the smaller its crystals, the fewer and less injurious the “planes of weakness,” and, *cæteris paribus*, the greater the specific gravity of the casting ; in fact, the better the gun, from whatever sort of cast iron it may have been formed.

I have shewn, too, by experiments made upon a very large scale, the results of which may be found in the Transactions of the British Association for 1840, and also in my work on the Construction of Artillery (1856), the important effects producible by casting under a great head of liquid metal, an increase of density of metal under a head of 14 feet = about

44·8lbs. pressure per square inch being obtained (with some makes of iron) in the ratio of 7·1035 : 6·9551.

Some experiments made in the United States upon this point have led to indecisive results, but only because the head of metal tried (amounting to but a few inches) was too insignificant to yield any clear indication.

It has been proposed also in America, in order to obviate some of the evils of unequal cooling, in large guns during consolidation, to cast them hollow and cool, from the interior as well as exterior—by passing through the former a cooling current either of air or even of water. The method has nominally been prescribed for the conduct of some of their government contracts for guns: but I have reason to believe that practically the device has been abandoned, and that, as most founders would have foreseen, the plan is too far removed from easy control, and too liable to produce evils greater than those it was intended to remedy, to be of any service. In fact, a cast iron gun cooled down too fast from the interior will be in a far worse condition to resist the strains of service than one that has cooled from the exterior surface only.

Practical iron-founders are in the habit of judging of what they deem by experience the best temperature of the fluid iron for being poured into the mould, by a certain peculiarity in the form of the vorticose movements that go on upon the surface of a mass of fluid iron, and called technically “the breaking” of the iron. This test, however, is perfectly empirical and fallacious; the very lowest temperature at which the iron remains liquid enough fully to fill every cavity of the mould without risk of defect, is that at which a large casting, such as a heavy gun, ought to be poured. As respects the rapidity of cooling desirable, we shall be enabled presently to consider the conditions that determine the extent to which it may be safely carried.

A certain amount of contraction on becoming solid from the liquid state occurs in all castings. It is well known to

practical foundrymen that for cast iron, this is variable, and depends upon the mass of the casting, being greatest for small, and least for large castings; but it is obvious, and it follows, from M. Bolley's researches, that the contraction also will be greater in proportion as the metal is poured into the mould at a higher temperature, although, from the expansion in the act of crystallising, the specific gravity of the solid mass may be less at the higher than at the lower temperature of "pouring."

As therefore there are two conditions that principally affect the degree of contraction, the total change of volume between the liquid metal and its solid casting, namely, the extent to which the fluid metal as entering the mould has been expanded by elevation of temperature, and the state of final aggregation of the crystalline particles, which we have seen depend much upon the former, so there will be a determinate amount of contraction due to a determinate thickness or mass of casting, irrespective of, though also related to, the co-efficient of contraction for any particular "make" of iron; for there is no doubt that different makes, *cæteris paribus*, contract somewhat differently. From whence it follows that different parts of the same casting, if differing materially in scantling or mass, will have different amounts of final contraction; and hence—

Sudden changes of form or of dimensions in the parts of cast iron guns, besides the injury they do to the crystalline structure of the mass, introduce violent strains, due to the unequal contraction of the adjoining parts, whose final contraction has been different.

How desirable is it, therefore, to introduce such changes into the forms of our ordnance as shall avoid these sudden and enormous (and often useless) changes of adjacent mass that we observe; as, for example, in the sea and land service, 13-inch mortars, where at the chamber the thickness of metal (where the strain is least) is nearly double that of the chase,

and suddenly becomes so; a malconstruction, the full evils of which we have not now time to consider.

The amount of *lineal* contraction due to solidification of cast iron appears to vary with metal and circumstances of casting from  $\frac{1}{100}$  up to  $\frac{1}{50}$  of the dimensions of the cold mass. Its contraction in volume therefore (more than three times this, and probably not equal in the directions of three rectangular axes) is so great, and the difference such between its measure for large and small parts of the same casting, that its effects never should be neglected.

Its effects are well known to founders in causing castings of certain forms to become distorted, or spontaneously broken, after they have solidified. To multiply instances would be tedious, but one circumstance requires remark, as proving that these internal strains, occurring in castings of variable bulk, exist when little suspected, and that it is with extreme slowness that the molecules, after consolidation, appears gradually to assume changes of minute arrangement, and to adjust themselves within certain limits to a state of permanent equilibrium.

It is a fact known well to practical mechanics engaged in boring or turning, or otherwise cutting into large castings of iron that have cooled safely and without crack or flaw, that yet, when a part of the whole mass shall have been cut away, as for example, when a large and thick flanged cylinder, or a large-toothed wheel or other irregular discoid mass, is "bored out," the form of the exterior of the mass changes during the operation. The portion cut away destroys the temporary equilibrium that was established in the mass, and it again changes its form and perhaps its symmetry. For some most valuable illustrations of the singular forms or lines of direction which the curves of internal tension and compression take in solids of various forms thus under elastic constraint, Mr. Maxwells' paper, Trans. Royal Society, Edin. vol. xx. part I, may be consulted.



They bear a remarkable analogy to the nodal lines traced by the researches of Chladni and Savart in the vibrations of sonorous plates, and directly are connected with the optical properties first shown by Sir David Brewster in glass under constraining forces.

Sometimes a casting which has cooled safely will fly to pieces on receiving a sudden jar or blow of a trifling degree of force. A fact which is in analogy with that observed by Captain Parry in his earlier Arctic voyages, viz., that the astronomical instruments exposed to extremely low temperature for long periods and quite undisturbed, did not contract to their extreme points until after they had been subjected to some slight jar or blow, when the metal of the instrument *suddenly* became reduced in volume and its dimensions again stationary.

The extreme slowness with which these molecular changes take place, due to the gradual adjustment of such internal strains, has been beautifully shown by M. Savart, in a memoir on the Elastic Properties of Solids (*Annales de Chemie*, vol. xli. p. 61). He found that plates of sulphur cast into flat discs continued to change their state of molecular arrangement for long periods after solidification.

It follows from this that old guns that have long been bored and laid in store are likely to be more trustworthy than those hastily cast, bored out, and brought into service, and this seems to be supported by experience in some degree.

Let us now proceed to apply to *wrought-iron* the law of molecular constitution already viewed in reference to cast iron; and then briefly to draw one or two conclusions as to the proper methods of construction of wrought-iron guns.

When wrought iron in any of the usual forms of its manufacture is fractured, its molecular structure presents itself, more or less distinctly pronounced, in one or other of three forms:

1°. Its mass consists of minute crystals of nearly uniform size, whose facets present themselves at all possible angles, like that of refined sugar. This "saccaroid" structure usually belongs to the most highly refined iron, and often to hard steely irons, such as those of Sweden. The larger bars of Low Moor iron present perhaps the finest examples of this structure.

2°. The surface of fracture consists of large, sometimes very large, lamellar spangles or plates, the facets of crystalline cleavage, whose directions tend to coincidence generally with the surfaces of fracture. The number, size, and directions of these facets varies in the same mass with the directions of fracture. This is the structure of all large and heavy forgings or of *large* rolled bars. This and the former structure are often found irregularly united in the same surface of fracture in ill-manufactured iron, and is the usual one presented by common small bar iron.

3°. The fracture (hard to produce, owing to the greater flexibility of the iron than in either of the preceding cases) when effected, presents long parallel fibres, or bacillary crystals, running in the direction of the largest dimension of the bar. This is the structure of the best and toughest iron, such as that for making chains and rivets, good boiler plates, &c. It is found partially combined with the 1st and 2nd in some inferior irons.

We found in cast iron that the law of arrangement of its crystals is to place themselves perpendicularly to the surfaces of the mass. In wrought iron the tendency is, upon the whole, to place themselves parallel to the principal surfaces. It would seem, therefore, at first, that the law of aggregation, apparently so opposite, must depend upon totally different conditions; they are, however, essentially the same. *In wrought as in cast iron, the principal axes of the crystals tend to assume the directions of least pressure throughout*

*the mass, while exposed to pressure and heat in progress of manufacture.*

Let us take the most strictly normal structure, the 3rd; for example, a round bar of rivet iron half an inch in diameter. This has been formed by the pressure of the grooved rollers in directions transverse to the axis of the cylinder, pressing it smaller and smaller, and still elongating it from a short thick mass, whose original structure, if broken, may have been that of 1 or 2. The metal, being rolled at a temperature at which it is as soft as lead at ordinary temperatures, heat is evolving the whole time, as in the case of cast iron in cooling; but the pressures introduced within the mass are of a different character, and arise from a different cause. In cast iron they arose from the contractions of the mass in cooling. In the wrought iron bar (relatively small in two of its dimensions, and therefore little affected at all by contraction in cooling), the internal pressures are produced by the rollers; but their pressures are all in directions perpendicular to the length of the bar, or, in our round bar, in the directions of the radii of the cylinder. The direction of least pressure is therefore coincident with the length of the bar, and this is the direction in which the principal axes of the crystals arrange themselves. The same is the case with iron drawn into wire, where the directions of maximum pressure being manifestly in the plane of the "drawplate," the aperture in which presses powerfully round the periphery of the solid passing through it, that of least pressure is, as before, parallel to the length of the wire, and so are the fibres or crystals arranged.

Heat, as increasing malleability and ductility, facilitates the arrangement; but as iron is a ductile substance even when cold, so heat is not essential to the molecular change in the arrangement of its particles; just as in cast iron we saw that molecular transpositions may continue long after the mass has become solid.

This is as strictly in analogy with observable facts of crystallization in other bodies, whether simple or compound, ductile or rigid, passing through an intermediate plastic state, or crystallizing per saltum, which crystallizes in bacillary or fasciculated crystals, as were the analogies we found in the case of cast iron. Thus, for example, arragonite, tourmaline, gypsum, actinolite, manganese, alum (from Cape Coast Castle), amianthus, &c. &c., are all frequently found in embedded (more or less rounded) fasciculi, of long parallel fibrous crystals. When these are examined carefully with a lens, the external crystals are always found more or less deformed by the pressure of the external embedding matrix, to which they are moulded, although not formed by infiltration and gradual filling of a mould. In every such case there are accompanying evidences of great pressure in directions perpendicular to the longer dimensions of the bacillary mass. Thus nearly cylindric pencils of arragonite are found so formed in the intensely compressed chalk, overflowed by huge incumbent caps of basalt in the North of Ireland. Similar pencils are found, though not cylindric, of tourmaline, in granite, manganese, alum, and fibrous gypsum, in enormously deep beds of clays, which, when soft and plastic, transmitted the pressure of their own mass of hundreds of feet in depth, with the fidelity almost of a fluid. Again, amianthus in serpentine, whose configurations prove the former play of enormous pressures, through plastic masses since become solid and rigid; and instances might be greatly multiplied.

Two of the examples given—arragonite and gypsum—present the remarkable identity, that they are found in both of two conditions, viz. in the arrangement of the crystals of cast-iron, with their principal axes perpendicular to the bounding planes, and parallel to them as now indicated for wrought iron; in each case the arrangement having followed the lines of least pressure, howsoever produced, provided it were coincident in time with such other conditions, whether

of ductility, plasticity, fusion, or liquidity by solution, as admitted of molecular transfer and re-arrangement.

Returning now to the wrought-iron rolled bar, while its diameter continues small or moderate, although, in the progress of its cooling, internal strains and variable pressures are induced by contraction,—still, as almost all appreciable contraction is confined to the one direction of the bar's length, so these new internal pressures are inoperative in producing any distinct changes in the disposition given to the (fibre or) crystals in rolling. Not so, however, if the diameter of the bar, in place of being small, be very large in proportion to its length, and its mass great in proportion to the pressure brought upon it by the rollers. The operation of rolling is then less effective in the first instance to induce a general and uniform parallel arrangement in length of the principal axes of the crystals; some remain in other directions to the bar's length: the bar, however, is now let to cool; fresh internal pressures become developed by contraction within its mass; the cooling goes on much more slowly, for the mass is much greater, in proportion to its surface, than in the long slender bar; and hence there is time for the new play of forces to act in re-arranging the crystals; the heat is carried off most rapidly from the greatest surfaces of the solid—but these are the sides of the bar. The contraction is greatest in the direction of its length; the maximum pressure due to contraction, therefore, coincides with the length of the bar; and more or less of the crystals arrange themselves now *transverse* to the length of the bar, in the directions of least pressure.

Whether the crystals of iron expand and contract by change of temperature alike in all axes is not known as yet; if not, and that the principal axes are those of greatest expansion and contraction, then, as the longitudinal contraction of the whole bar is proportionally greater than that in either of its other dimensions, so the previous longitudinal arrangement of the crystals, in so far as rolling has been operative in producing it, now increases the tendency to the

secondary re-arrangement of the crystals transverse to their former position. The small slender bar cooled almost instantly, and at once fixed the crystals and the longitudinal position they had assumed—length of time in cooling admits of the re-arrangement in the heavy thick bar—aided by the softened condition of the mass as it passes gradually from a yellow heat to coldness.

Thus then as the mass—the relation of this to form and hence to surface—and of all, to the pressures transmitted to the iron in rolling, and to those induced subsequently by contraction in cooling, are varied, so will the main directions of crystalline arrangement be varied also; the variation may be either total and complete, as in the case of the slender bar, or partial and imperfect as in the grosser bar. But the evidences of ANY arrangement must depend upon the extent to which the individual crystals in any particular “make” of wrought iron are susceptible of development; in the case of *very* highly-refined iron (in the language of the iron-master “over-wrought” iron, in which there has been no “cinder” left), with all its carbon perfectly combined, and thus approaching to steel, the crystals are so minute, often so perfectly microscopic, that in large bars no other than the uniform “saccaroid” structure is discernible, though the fibrous becomes perfectly developed in any small ones. This is the case with the fine Low Moor iron, which in rolled bars of 2 inches diameter and upwards presents a fracture almost identical with that of cast steel, but in rivet-rods a fine fibrous one.

I have used the term “fibre” as being already long in use, and conveying well to the eye the character of this particular form of crystallisation. But it should be clearly understood that the “fibre” of the toughest and best iron is nothing more than the *crystalline arrangement* of inorganic matter, and that the false analogies continually used, in which such fibre is spoken of and reasoned upon as identical with that

of organic bodies, such as wood, hemp, &c. have no reality or basis in nature, and only tend to mislead.

The principles upon which the developement in size of individual crystal depends, however, will be best understood when we have considered some of the effects on wrought iron of forging into great masses.

In *rolled* bars, which we have so far alone treated of, the pressure of the rolls, unaccompanied by impact, though conveyed only to the one point of the bar at a time, is in succession and with great uniformity of direction applied to every part of it; moreover, the intensity of the pressure upon the unit of surface, or in relation to the section of the bar, steadily increases as the latter diminishes in size at each successive passage through the rolls.

A very different set of conditions occurs, however, in a *forged* bar or mass. The whole of the pressures now are impacts suddenly applied to local points of the surface, and thereby unequally transmitted through the ductile or partially ductile heated metal to its interior. The pressure at the surface due to any blow measured in the time of the hammer's descent through the space through which the surface before the blow has descended, is rapidly lost in transmission within the mass, by inertia, and by the corpuscular forces of whatever sort that the substance of the heated iron opposes to change of form. Blow follows blow in continually changing directions, and on various portions of the mass. The directions of maximum pressure within it as constantly change as do the intensity of these pressures, not only in depth, but as transferred from point to point struck; the elasticity of the metal (though no doubt of a different sort from its elasticity when cold and more perfectly a solid) still exists, but in the various parts of the mass kept during the hammering, and perhaps for long after, in a state of instability. The lines of least pressure, therefore, are constantly changing under all these varying causes, and with them

the directions of the principal axes of the crystals become changed and changed again—perturbed, broken, and confused; and if the mass be sufficiently large, when cold, and after its forging has been completed, its fracture, however fine and good the wrought iron, presents nothing but a confused mass of small crystalline facets differing scarcely at all from the appearance of cast iron in moderately large castings.

Yet no change other than that of molecular arrangement has necessarily occurred in the large mass, for it is a fact that such a confusedly crystallised mass may be built and “faggoted up” from small rolled bars, each of which is previously perfectly and uniformly fibrous, that they lose their fibrous structure and assume the confusedly crystalline one in the process of being united by forging into one large mass, and that a portion broken or cut off from the mass may be again rolled down into small bars, which shall be as fibrous in structure as at first.

The developement in size of crystal varies with the particular sort of iron. It appears to be largest and most lamellar (in large masses) in the most highly refined iron, and which contains an unusual dose of silicium; but the relations of size of crystal to chemical constitution require much further examination. With the same iron and same volume of forging, however, the size of crystal appears to be developed larger, in proportion to the time that the mass is maintained hot and in process of forging. This time is necessarily greater as the mass is so, and as the operations of reducing it to required form are more complex or laborious. In fact, as in cast iron we saw that the crystals were larger the longer the mass required to cool, so in wrought iron they are larger the longer it is kept hot. And thus it happens that in very large and massive forgings, requiring often to be maintained at temperatures varying from a welding heat down to dull redness perhaps for weeks, crystals are developed within the mass of a size materially to diminish the



cohesion of the iron in some places where flat planes of crystalline cleavage produce partial "planes of weakness". The size of these crystals is occasionally surprising, the broadest and flattest planes of cleavage frequently running in the directions in which surfaces of the integral "slabs" or portions of iron of which the mass has been formed have been welded together. The author has observed crystals so posited presenting flat planes as large as the surface of a half-crown piece.

*The elasticity of wrought iron is greatest in the direction of the principal crystalline axis.* Some experiments of Mr. Fairbairn's on the relative ultimate resistance to rupture of boiler-plates, when strained in the direction of their fibre, *i. e.* in the direction in which they were rolled, and transversely to the same, have induced him to come to the conclusion that there is little, if any, difference in either direction. If the iron of the plates be so very harsh, rigid, and bad of quality, as to have *no* (fibre) longitudinal crystalline arrangement, but approach nearly to that of a slab of cast-iron, this may perhaps be nearly true, but in plates or bars of good quality it is certainly erroneous. The very few experiments upon which Mr. Fairbairn's conclusion rests, will not even warrant it, if *one* result, contrary to all the others, and so exceptional as to suggest the probability of an error, be abstracted from the average deduced from the remaining ones; and it seems wholly disproved by the experiments of Mr. Edwin Clarke (*Britannia Bridge*, vol. i. p. 377), who found that bars cut longitudinally and transversely from the same plate of fine fibrous iron of excellent quality, were broken by strains per square inch of section of—

	Tons.		Tons.
In the direction of the fibre...	19.66	to	20.2
Across the fibre.....	16.93	to	16.7

and that *the ultimate extension of the plate in the line of the fibre was double as great as transverse to it.*

Taking the means of these experiments then at 20 tons longitudinal, and 17 tons transverse, the value of the coefficient  $T_r^*$  in each case will be—

In the line of fibre.....	= 234.84
Across the fibre.....	= 30.47

Taking the total extension = .0016 in the first, and half that in the second.

We find, therefore, that the elastic range of wrought iron of any given quality depends upon the direction of the crystalline axes in relation to the strain, and that the elasticity is a maximum in the direction of the principal axis of the crystals, or line of fibre; and the important deduction arises from the above, that, for artillery purposes, the ultimate strength of a gun, in which the explosive strains are all resisted by wrought iron acting in the line of fibre, is to that of one acting transversely to the same, as 234.84 is to 30.47, or about as  $7\frac{1}{2}$  to 1. This ratio expresses in fact the relative strengths of a "twist barrel" and of a common "skelp-welded" or longitudinally welded one; but almost the whole advantage of this is lost in massive forgings.

We have found that the effect of large increase in the mass of wrought iron is to prevent any regular or uniform arrangement of its integral crystals by the process of manufacture. That as such masses are necessarily continued long heated while forging, and occupy long in cooling, and contract considerably in all their dimensions in cooling, so the crystals are developed to a large size, and become arranged to a greater or less extent in directions transverse to the surfaces of contour of the mass. The results are irregular "planes of weakness," reduction of ultimate strength to resist a quietly and steadily applied tensile force of from 20 to 17, and reduction of resisting power to such impulsive forces as are concerned with artillery, in the ratio of from  $7\frac{1}{2}$  to 1, or probably even more; for a train of difficulties is introduced in the

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\* Poncelet's coefficient of "vis viva of rupture"

manufacture, and of injuries done to the chemical qualities of the material, in a rapidly increasing proportion as we continue to increase the magnitude of the mass to be forged.

When the mass exceeds a very limited bulk (in breadth and thickness) the processes of rolling, &c. are at an end. Those of forging by the tilt or steam hammer alone are available; skilled labour, and all the mishaps to which the results of the most adroit workmanship are exposed in dealing with the heating and hammering of vast and scarce, manageable masses, are inevitable. The mass must be gradually built up and aggrandized in size, by continual welding on to it of small pieces, involving reiterated heating and partial cooling, exposure for weeks perhaps to a temperature at which the exterior of the mass gets changed more or less in chemical constitution, and at each welding the risk of inclusion of more or less slag, cinder, or other foreign matter. At every additional piece thus laid on by welding, an additional doubt is produced as to whether or not the weld be sound throughout; no examination at the time can with certainty decide this: the mass however grows continually in bulk and weight, the inertia of the hammer (large and powerful as this has become through the intervention of the direct action of steam) becomes reduced in relation to that of the mass in the same ratio, the blow no longer acts with uniformity upon the mass submitted to it, but is confined in immediate effect nearly to the point struck. The mass, if very large, and especially if also long, can no longer be all maintained hot, but the jar and shattering vibration of every blow, as it thunders down upon the huge piece, continues to be transferred to the crystalline particles of the colder or quite cold portions, and probably produces at length some considerable alteration of molecular arrangement, in deterioration of strength.

At length the limit is reached when with our present known modes of working wrought iron (even with the heaviest and

best appliances) we can no longer add to its size. The limit is reached by the power of heating the mass, or a certain required part of it, to the welding heat. The time required for the piece to remain in the furnace to effect this continually increases as its bulk grows, and with it the sources through which heat is lost and dissipated; but a certain proportion of iron is burnt away or melted off from the surface at the part requiring to be brought to welding heat and from adjacent portions at every moment that it remains in the furnace; at last as much in weight is burnt off or lost, at each welding as equals the weight of the "slab" or mass laid on, and the labour is then in vain. The work, like the embroidery of Penelope, becomes an endless task, and the limit has been reached beyond which the piece can be forged no bigger.

This limit can be stretched a good deal by the extreme skill of the operative forgerman and by the skilful construction of his furnace; but, however great these may be, this limit is at length reached by all, and with our existing tools in great Britain is probably reached in every case at a diameter (of a cylindrical mass) of about four feet and about twenty feet in length.\*

To the unpractised observer, who looks at one of these ponderous masses withdrawn from the furnace glowing like a sun, and observes the apparently little effect upon it that the thundering blows dealt by the steam-hammer produce, it always seems that nothing more is demanded than great increase of weight and length of stroke, or increased power in the hammer. This however is a mistake; good forging in heavy masses depends not so much upon the force of the blow as upon its exact direction, and its application at the precise moment when the welding metal is fit to receive

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\* I am aware that these "difficulties of heavy forging," though undeniable, are attempted to be made very light of by a recent writer of one of the articles on "The Useful Metals" in *Orr's Circle of the Sciences*. The able and intelligent manager of the Mersey Steel and Iron Company's forge will, I trust, pardon my saying that his opinion cannot be considered unbiassed upon such a subject.

it. The only effect of great increase in the power and especially in the velocity of the blow is to shatter and dislocate the internal or adjacent portions of the mass which are at or about, a low (cherry) red heat, at which temperature the best wrought iron appears to lose much of its plasticity of heat, and be comparatively crumbling and brittle. In fact, with existing hammers of five tons weight and six foot blow, this effect is actually produced very frequently.

Another and very different cause of unsoundness in very large forgings of great diameter I have recently observed the conditions of with care and explained elsewhere. It arises from the fact that in the slow cooling of such a mass the exterior becomes cold and rigid while the interior is still soft and even above a red heat. When finally the latter cools to the point of rigidity violent cross strains, owing to complex play of contractile forces (which time forbids my here entering upon), are produced, and the interior of the mass tears itself asunder, irregularly, but in a general plane passing through the axis and parallel to it, if it be a cylinder or prism, and reaching across about half its diameter. This defect is not visible until the mass be cut transversely. This is the main cause of the almost constant want of soundness in nearly all large forgings.

If we are to look for future great extensions of our power of producing vast masses of malleable iron (for whatever purposes) that shall give greater assurance of internal soundness, and preserve in the large, all the qualities of uniform and determinate disposition of fibre—in a word, all the valuable qualities of the best wrought iron as now known in small bars, it must be by some great extensions or modifications of the rolling process, accompanied by such improvements in the furnaces and modes of heating as will enable the largest masses of prismatic form to be produced out of more slender rolled bars laid together and heated, and at one welding operation rolled together (or otherwise pressed at successive points)

into one gigantic bar, which for artillery might be then twisted by suitable machinery, such as that patented by Melling. To the subsequent operations of bending, cutting, or shaping such prismatic masses however, so as to fit them on a large scale for the many general purposes to which forged pieces, or "uses" as they are called, are now applied, narrow limits of practical disadvantage and difficulty can be foreseen; and as regards the fabrication of artillery it scarcely admits of doubt that the limit of useful size has been already far surpassed, and that it is to a skilful and judicious combination of parts, each formed of malleable iron of moderate and manageable dimensions, rather than to forging in one huge piece, that we should look for the production of guns of the largest class in this material.

Those who desire to enter upon the consideration of the best modes of attempting this, I must refer to the pages of my own work upon the construction of artillery, as well as to those of others who have proposed various constructions of compound or built-up guns. The subject is too large, and involves too many dynamic questions of an abstruse character, besides those physical ones of which we have been treating, to be entered upon now.

I cannot leave the subject of molecular constitution in wrought iron however, without explaining one most interesting case in which the law of aggregation before enunciated, throws a flood of light upon a hitherto ill-understood and obscure class of phenomena, namely, upon *the change of crystalline axis in wrought iron cold*—that is to say, at ordinary temperatures; that change by which, without sensible heating or cooling, without fusion or change of external appearance, and often with little change of form or volume, a piece of wrought iron, before tough, flexible, and "fibrous," may be made to become instantly harsh, rigid, crystalline in fracture, and brittle. This is the change by which it has been *assumed* that railway axles, shafts, chain-cables, &c.,

and other articles of tough fibrous iron, grow brittle and faithless while in use.

Much has been loosely written of late years on this subject, proposed "loss of fibre" and change to a confusedly crystalline structure in wrought iron, by the mere effects of long continued jarring or vibration, or of very slight bending to and fro at ordinary temperatures; many affirming stoutly the fact, but without bringing forward any instance that amounts to proof; and others denying it, asserting in explanation, that in the instances adduced the "crystalline iron was never fibrous," and which is probably the fact in most of the cases adduced.

The subject is one still requiring, for its being fully understood, a very careful and difficult research, and one worthy of being at once made. The following conclusions may however be provisionally offered, as probably not very incorrect:—

1.° There seems no reason to believe that any extensions or compressions, and therefore any flexures, however long continued or often repeated, produce any molecular change whatever in wrought iron; provided that—

a. The range of extension or compression be *far within* the elastic limits.

b. That the velocity with which the extension or compression is made be not extremely great, *i. e.* not beyond the "pulse period," due to the elasticity of the material.

2.° Nor any reason to suppose that jarring or vibration, if unaccompanied by permanent change of form in the mass, is capable of effecting any molecular change whatever, provided that the material shall have been previously in a state of molecular repose, *i. e.* free from internal strains due to form, contraction on cooling, &c.

Nor is it probable that abrasion, such as the grinding away of the bearings of railway axles, or the scoring and

rifling of the chase of a wrought-iron gun by the passage of the shot, produces any molecular change; but—

3° It does appear certain, from many well observed phenomena, that instantaneous changes of molecular structure, and reversals or transpositions of the crystalline axes, can be produced in wrought iron at ordinary temperature, by the violent application of mechanical force, producing change of form at one or more points of the surface of the mass, if the directions of the force and the extent of change of form be such as to produce internal strains and inequalities of pressure, and that the extent of these latter is greater than the resistance in any one direction, due to the elasticity and range of the material.

It would be foreign to our subject to pursue this here at any great length, however interesting and important, and with one familiar instance we must dismiss it.

The well known operation by which a blacksmith “breaks cold, over his anvil,” a bar of the toughest iron that can be had, consists in “nicking” one or both opposite sides of the bar at the required point of its length, to a *very small* depth, with a chisel having an edge formed to a very obtuse angle generally about 90°, and driven into the substance of the bar by blows from a sledge with great velocity. When this is done, a bar of moderate size, tough, fibrous, and at every other place capable of being bent sharply double without fracture, may be broken across at the “nicked” place often by bending over one’s knee, but always by a few light blows transversely on the anvil.

When the fracture is exposed, it is found at the “nick” to be short and crystalline; the crystals are, on the whole, arranged transversely at this point to the bar’s length; their facets are largest and most transverse just at the bottom of the angle of the nick; and either no sign of the fibre constituting the structure of every other part of the bar is



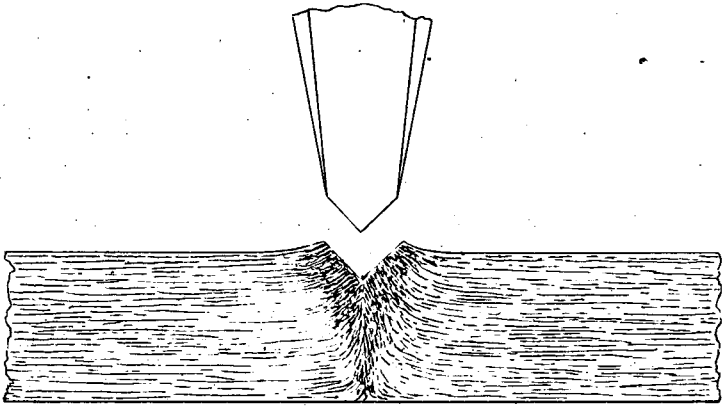


Fig. 1.

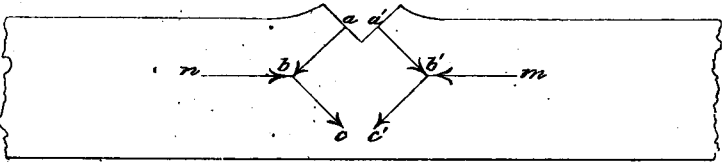


Fig. 2.

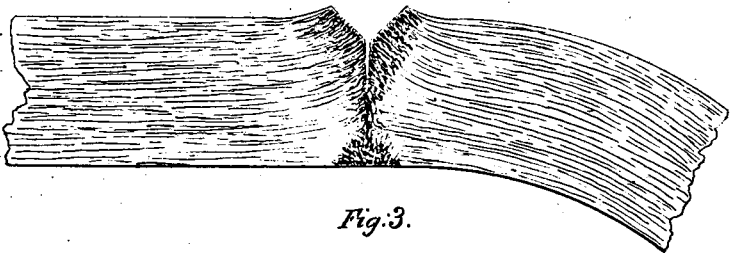


Fig. 3.

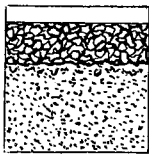


Fig. 4

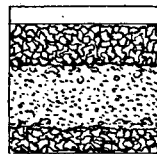


Fig. 5.

visible, or occasionally some portion of the section at the side or part most remote from the nick is still visible.

Now what happens here is rendered obvious by the diagram in Plate 27., in which fig. 1 represents the side of such a bar at the "nicked" place, and the change of direction there of the crystalline axes. But what internal forces have acted on them? Looking at fig. 2, it will be seen that driving into the substance of the bar the edge of the wedge-shaped chisel, has produced compressions; but the pressures are propagated in directions perpendicular to the faces of the wedge, or of the nick that is the express copy of it. These pressures in the directions  $a b$ ,  $a' b'$ , are resisted and finally equilibrated by the elastic compression of the crystals in the directions of their principal axes (mainly)  $c b$ ,  $c' b'$ , and the resultants of these mutual pressures meet in the substance of the bar, in the direction  $b n$ ,  $b' m$ , which are those of maximum internal strain; therefore in the space between these, and approaching the angle of the nick, and perpendicular to the resultants, are the lines of minimum pressure. Now these are the new directions that the principal axes of the crystals assume at the moment that these pressures disturb their previous equilibrium; that is to say, at the moment of making the nick.

Fig. 3 shews the further change in crystalline arrangement assumed by the bar, after that above described as due to the "nick," and which is produced by the subsequent bending prior to final fracture.

Supposing the bar bent by pressure or blows towards the side remote from the nick, as soon as the fracture is complete it presents a surface as in fig. 5, consisting of faceted crystals piercing the bar transversely from the angle of the nick to a certain depth—a central portion where the original longitudinal fibre of the bar has remained unchanged but is broken across,—and again a narrow strip of flat faceted—

crystals at the side furthest from the nick transverse to the line of fibre. Now these latter were produced by the bending of the bar after the nick had produced the former. The side furthest from the nick is the *compressed* side of the bar, the neutral line being somewhere between. *The direction of least pressure* at this compressed side is therefore *transverse to the length of the bar*, and hence the new direction taken up by the crystals here in accordance with the general law. Had the bar been bent towards the side nicked in place of the opposite way, the nicked side would have been the compressed side, where the transverse crystals were already formed, and the fracture when broken across would have been fibrous out to the very edge remote from the nick (provided the whole bar had been uniformly fibrous beforehand) as shew in fig. 4.

Thus then this change of crystalline arrangement is only another case of our general crystalline law—that the principal axes are found in the directions of least pressure within the mass, and that the change of direction possible to be produced in “cold iron” is due to the fact of its having more or less ductility at all temperatures, which means, in fact, that more or less permanent displacement of molecules is possible in the material at any temperature.

There is therefore no ground for assuming that wrought iron artillery would rapidly or at all (if originally properly proportioned) deteriorate in tenacity, and so gradually and yet unascertainably become unsafe in service.

Mr. Nasmyth, M. Hood, and Mr. Thorneycroft have written on this subject; the latter has collected some interesting facts, though some seem rather warped by preconceived views. In no paper, however, that the author has seen is any attempt made to connect all the phenomena of change of

crystalline structure in iron at all temperatures with the action of some one recognisable force, such as that which the author believes to constitute the true solution and key to all the varied and complex cases noticeable, and which he has been the first to enunciate, namely, *the assumption by the principal axes of the crystals of the lines of minimum pressure within the mass.*

In concluding this second head of the three into which I have divided the subject of my lecture this evening, I would wish to be understood, that I do not advocate the indiscriminate adoption of built-up guns of wrought iron, nor even the indiscriminate use of wrought iron guns at all. I do consider, and my conclusion has been come to after a lengthened and careful investigation of the subject, and the endeavour to apprehend and attach due weight to the purely military aspects of the matter and the opinions of artillery officers, that the adoption of wrought iron as a material for field artillery would be attended with the most important results. Some of these, chiefly those relating to financial economy, durability, and the facility and economy of transport in service, may be learned by an inspection of the following tables, in which the results of much patient research are condensed, and which appear to me conclusive in support of the value of wrought iron for this particular arm.

Wrought iron field-guns, however, are readily within our grasp to form, soundly, simply, and with cheapness, by methods which I have elsewhere pointed out, in one piece, up to 18 or perhaps even to 24 pounds at least; and as assuredly the rifle principle will ere very long be successfully applied to field artillery (and so its predominance over the rifled musket again asserted), so it is not likely that larger calibres than these, if even so large, will be ever demanded for field-service.

TABLE I.

*Of the Physical Properties of the Principal Materials of Construction for Artillery, from British Data.*

1	2	3	4	5	6	7	8	9
No.	MATERIAL.	Ultimate Resistance to		Immediate Resistance within Elastic Limit.		Mean extension per ton per square inch within.	Mean compression per ton per square inch within.	Final extension at the Elastic Limit.
		Tension.	Compression.	Tension.	Compression.	Limit of Col. 5 in terms of L.	Limit of Col. 6 in terms of L.	In terms of L.
		Tons.	Tons.	Tons.	Tons.			
1	Gun Metal.....	16	12†	4.5	3†	.000230	†	.00104
2	Cast Iron.....	10	45	4.0	20†	.000220	.00018	.00088
3	Wrought Iron.	27	16	12.0	12	.000100	.00010	.00120
4	Steel.....	49	60†	16.0	17.5†	.0000375	†	.00050

No.	MATERIAL.	10	11	12	13	14	15	16
		Modulus of Elasticity.	Modulus of Elasticity $e$ .	Coefficient of Elastic Resistance $T_e$ .		Coefficient of Elastic Resistance of Rupture $T_r$ .		Modulus of Force Transmission.
		$L_e$ .	In Pounds per square inch.	Tension.	Compression.	Tension.	Compression.	
		Feet.	lbs.	Dynams.	Dynams.	Dynams.	Dynams.	Feet.
1	Gun Metal.....	2,790,000	9,873,000	5.24	†	65.94	†	8260
2	Cast Iron.....	5,750,000	18,400,000	3.94	80.64	24.64	110.88	11100
3	Wrought Iron.	7,550,000	24,920,000	16.13	16.13	81.64	48.40	12083
4	Steel.....	8,530,000	29,000,000	10.75	†	92.55	113.33†	14108

NOTE.—The moduli of Elasticity are Tredgold's. The values of  $i$ , from the means of various experimenters, as also the values of columns 3, 4,  $\epsilon$ , and 6.

TABLE II.

*Comparison of Weight, Strength, Extensibility, and Stiffness; Cast Iron being unity, within practical limits, to Static Forces only.*

MATERIAL.	Weight for = volume.	Strength.	Extensi- bility	Stiffness.	Torsion.
Cast Iron.....	1.00	1.00	1.00	1.00	Resistance 1.00
Gun Metal.....	1.18	0.65	1.27	0.53	0.55
Wrought Iron.....	1.07	3.00	0.45	2.20	1.11
Steel.....	1.07	4.75	0.32	3.15	2.11

The torsion from Colomb and Tredgold's results.

TABLE III.

*Molecular Properties of the principal Materials for the Construction of Artillery.*

1	2	3	4	5	6	7
No.	MATERIAL.	Chemical Constitution.	Specific Gravity.	Relative Torsion of Rupture.	Temperature of Maximum Strength.	Coefficient of Expansion for 150° Fahr.
1	Gun Metal.....	Cu 17+Sn	Mean 8.450	Degrees 367°	32°	.001816
2	Cast Iron.....	Fe.C+C+m	7.200	52°?	300°?	.000893
3	Wrought Iron....	Fe.C+m	7.750	330°	360°	.000984
4	Steel.....	Fe.C	7.800	200°	?	.001225

		8	9	10	11	12
No.	MATERIAL.	Specific Heat.	Coefficient of Con- duction for Heat.	Relative Hardness.	Relative Resistance to Abrasion.	Relative Oxidation in Moist Air.
1	Gun Metal.....	0.110	?	?	?	.10 ?
2	Cast Iron.....	0.134	236?	5	10.5	.42
3	Wrought Iron...	0.109	110?	20	322.6	.54
4	Steel.....	0.109?	100?	40	968.4	.56

Col. 11, = hardness  $\times T_0$ .

Col. 12, from the Author's experiments, Trans. Brit. Ass.

TABLE IV.

*Comparative Financial Relations of the principal Materials of Construction for Artillery.*

1	2	3	4	5	6
No.	MATERIAL.	Average Cost per Ton in Guns in England.	Relative Section for equal strength.	Relative Weight for equal strength.	Relative Money Value for equal strength.
		£			
1	Gun Metal.....	160	1.60	1.880	5.33
2	Cast Iron.....	30	1.00	1.000	1.00
3	Wrought Iron.....	60	0.33	0.354	2.00
4	Steel.....	180	0.21	0.226	6.00

		7	8	9	10	11
No.	MATERIAL.	Relative Money Value for equal weights.	Relative Durability in Service where never overstrained.	Unserviceable value as old Material per Ton.	Loss per Ton on the first cost.	Relative Costliness, Capital and Durability included.
				£	£	
1	Gun Metal.....	10.02	4	60	100	251.00
2	Cast Iron.....	1.00	1	4	26	100.00
3	Wrought Iron...	0.70	22	6	54	3.25
4	Steel.....	1.36	156	15	165	0.87

*Note.*—Cast-Iron is taken as unity throughout.

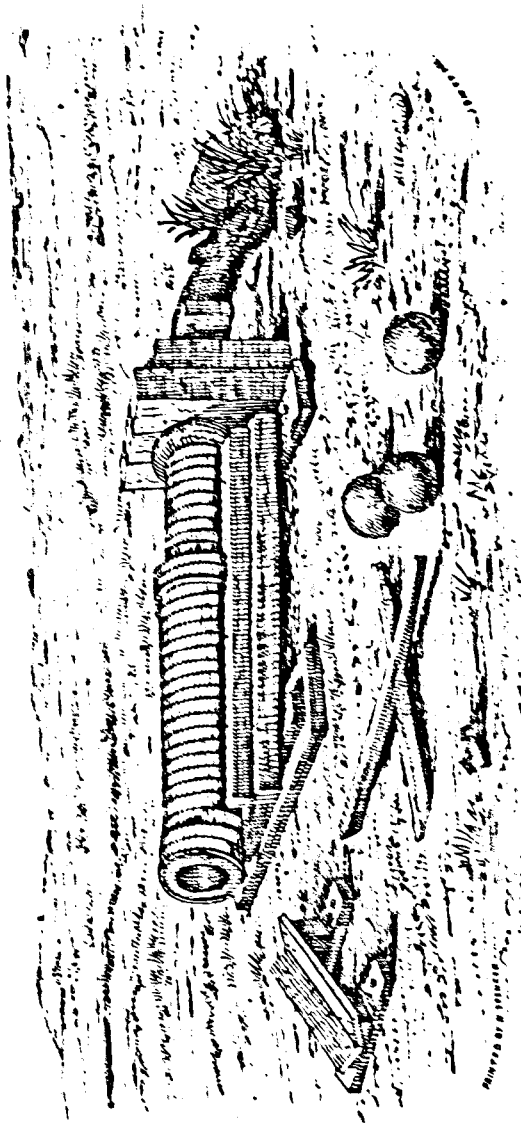
The relative strength is as opposed to static forces.

The relative durability takes account only of abrasion and corrosion.

Col. 10 = col. 6 × reciprocal of col. 8.

When we advance from the small calibres of field guns to those already demanded for garrison and siege purposes, and to the still larger calibres that the most modern uses of stone and iron in fortification, in or out of connection with earth-work, have now demanded, it is obvious that we *must* resort

Selections.

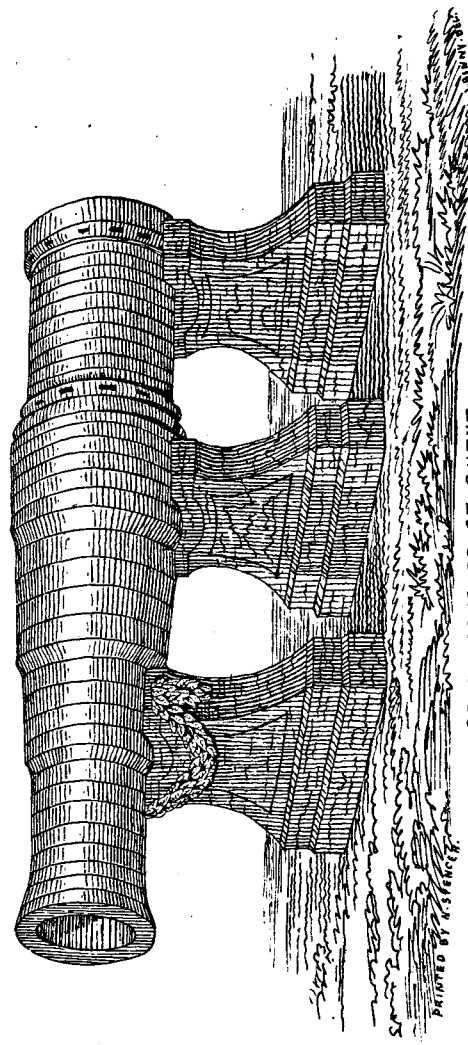


BOMBARD ON BED

DESIGNED BY H. J. HARRIS  
1862.



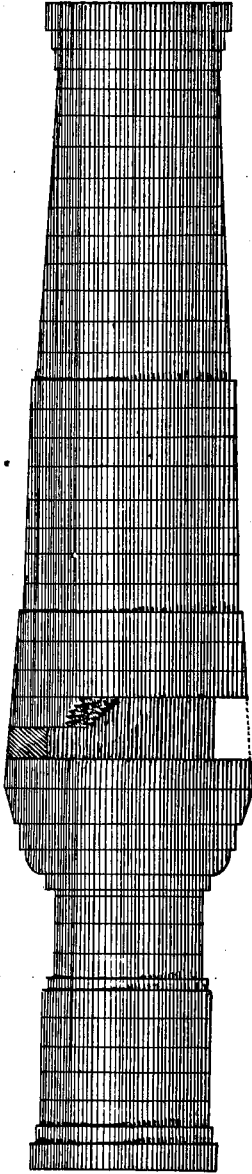
*Selections.*



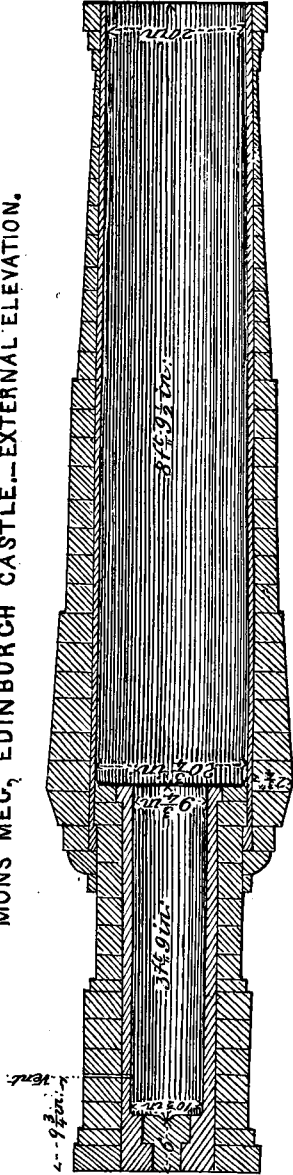
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GREAT BOMBARD OF CHENT.

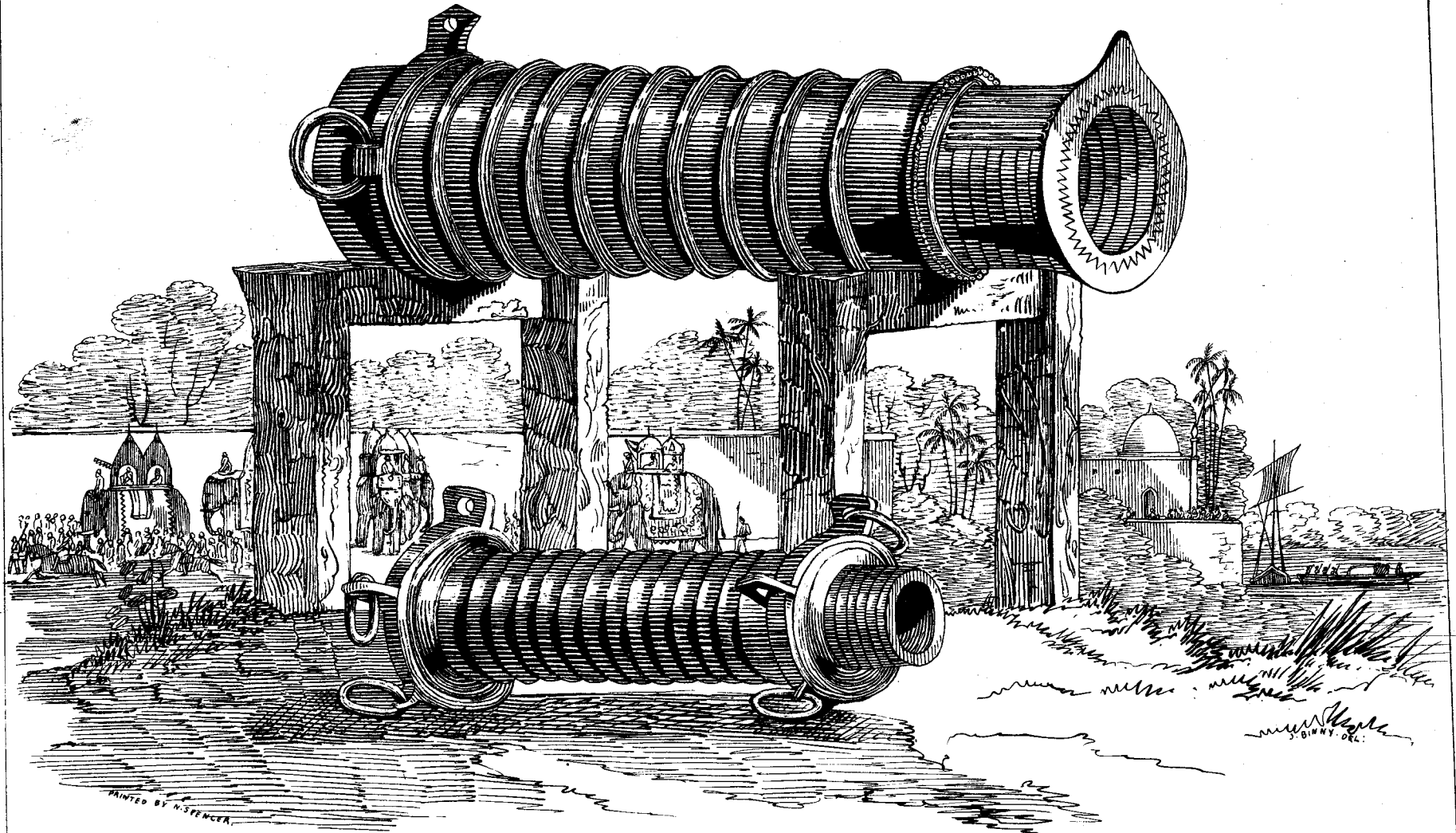
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MONS MEG, EDINBURGH CASTLE.—EXTERNAL ELEVATION.



MONS MEG, EDINBURGH CASTLE.—LONGITUDINAL SECTION.



PAINTED BY N. SPENCER.

MADRAS ARTY. DEPT.

THE GREAT WROUGHT-IRON GUN OF MOORSHEDABAD.

to wrought iron as the material for our immense artillery, and that we *must apply this material in such a form as shall develop its best strength and powers of resistance, and according to methods the cheapest and the most certain in manufacture.*

These methods develop themselves in the form of built-up guns, a construction the germ of which is very ancient, as may be seen in the drawings which I am enabled to exhibit of some ancient bombards of wrought iron, viz. the Mons Meg at Edinburgh Castle, the great bombard of Ghent, and, probably most ancient of all, the great bombard at Moorshedabad in Bengal. (Plates 28, 29, 30 and 31.)

The built-up principle was adopted in these pieces of great calibre, not from choice unquestionably, but because the imperfect methods of iron manufacture of those remote times left no option to their constructors. They acted without any accurate theoretic knowledge of the strains they desired to resist, or of the properties and measure of passive resistance, of the material they employed. Accident, however, compelled them to a structure in great part theoretically correct, so far as it was carried, but the immense mechanical advantages of the *superposition of hooped plies* was unknown to the makers of the ancient bombards, indeed theoretically unknown until very recently.\* Yet if such powers of resistance, as we know the middle age kamerlicks and bombards to have had, were obtained by untaught craftsmen, and with the feeble tools and defective metals of their days, may we not anticipate much from exact science and the marvellous powers of modern tools, when moving together in advance upon the same road that led to these ancient successful attempts?

To recapitulate then some of the advantages which the method of built-up wrought iron guns offers, they are, as respects the material itself—

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\* See Mallet on the Physical Conditions involved in the Construction of Artillery. &c. 1855. Notes.

1°. The iron constituting the integrant parts is all in moderate sized, straight prismatic pieces, formed of rolled bars only; hence, with the fibre all longitudinal, perfectly uniform, and its extensibility the greatest possible, and in the same direction in which it is to be strained, it is therefore a better material than any forged iron can ever by possibility be made.

2°. The limitation of manufacture of the iron thus to rolling, and the dispensing with all massive forgings, ensures absolute soundness and uniformity of properties in the material.

3°. The limited size of each integrant part, and the mode of preparation and combination, afford unavoidable tests of soundness and of perfect workmanship, step by step, for every portion of the whole. Unknown, or wilfully concealed, defects are impossible.

4°. Facility of execution by ordinary tools, and under easily obtained conditions, and without the necessity either for peculiarly skilled labour on the part of "heavy forgers" or for steam or other hammers, &c. of unusual power, and very doubtful utility; and hence very considerable reduction in cost as compared with wrought iron artillery forged in mass.

5°. Facility of transport, by reduction of weight, as compared with solid guns of the same or of any other known material.

And as respects the mode of application—

6°. A better material than massive forged iron, is much more scientifically and advantageously applied; the same section of iron doing much more resisting work, as applied in the gun built up in compressed and extended plies, than in any solid or other gun.

7°. The introduction thus into cannon of a principle of elasticity, or rather of elastic range (as in a carriage spring,

divided into a number of superimposed leaves), greater than that due to the modulus of elasticity of the material itself, and so acting by distribution of the maximum effort of the explosion, upon the rings successively recipient of the strain, during the time of the ball's traject through the chase, as materially to relieve its effect upon the gun.

In a word, we secure better material and apply it better. It is upon these principles that I have designed for Government the great thirty-six inch mortars, to throw a shell of a yard in diameter, and weighing in flight above 3000 pounds, which are now nearly completed.

Had time permitted, I proposed, under the third and last head of our subject, to have considered the effect upon cannon, of another class of molecular forces, namely, those due to expansion by heat in service, and especially to have shown the enormously increased strains produced on cannon; both in very rapid firing and in firing red-hot shot, by the unequal expansion of the interior and exterior of the gun; the more expanded interior producing a powerful splitting strain upon the exterior, independent of and before the application of the expansive effort of the exploded charge; and, again, to have pointed out the true solution of the long well-known phenomena, especially in heavy bronze guns, occurring after rapid and sustained firing, known as "drooping at the muzzle."

I can at this late hour, however, only venture to enunciate merely, that "drooping at the muzzle" is not due, as commonly asserted, to softening of the bronze gun by heat, and its becoming then bent by its own weight, but that it arises from the conjoint effect, of longitudinal expansion of the gun by the heat of repeated discharges, and the *relatively greater cooling* of the lower half of the gun by the continual *evection* of heat from its lower side, due to the ascent of the currents of atmospheric air which reach the gun, become heated by it, ascend as they become lighter than the sur-

rounding colder air, and so carry off heat faster from the lower than from the upper side of the gun. This is true whether the gun be in still air or in a current of wind transverse to its axis, the chief difference being that, in the latter case, the gun is distorted more or less laterally as well as in the vertical plane. The play of forces producing this somewhat curious train of effects will, I trust, be easily understood by referring merely to the diagram exhibited (Plate 32.)

For a more full investigation of the whole subject of the effects of expansion by heat upon guns in service, I must again refer to my work "On the Physical Conditions involved in the Construction of Artillery," where I have shewn *how much* superior in this respect, as in all others, wrought and even cast iron, are to bronze as materials for ordnance.

Perhaps at a future time I may be enabled to lay before the Members of the United Service Institution some of the grounds upon which I consider that cast steel, which has had a good deal of popular and ill-thought-out advocacy, latterly bestowed upon it, is an unsuitable material for cannon; indeed, some of these grounds may be gathered from the four comparative tables of the properties of the constructive materials for ordnance which I have had the honour to present to the Institution this evening.

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*Note.*—On the MOLECULAR CONSTITUTION OF SOLIDS.

The law of crystalline arrangement in crystallised masses, which passes as a clue of illustration throughout this Lecture, would demand a separate work, to treat it as its important relations to many of the most interesting questions of physics, and its enunciation, with clearness, would deserve.

To fulfil this in a note is impossible; a few remarks should, however, be added to the text. By principal axes of the integrant crystal, in metallic masses becoming crystallometrically arranged, under the influence of heat or pressure due to its motion, I do not necessarily mean the optic axis, even

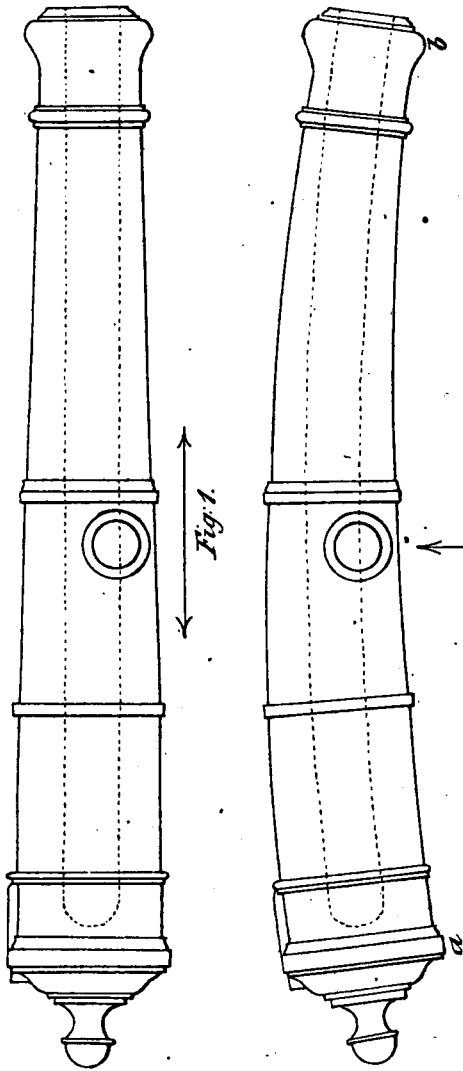


Fig. 2.

DROOPING AT THE MUZZLE IN BRONZE GUNS.



such determinable opaque bodies, such as the metals, but that symmetric axis of the integral crystal, whose position, after consolidation of the mass, is found coincident with the direction in which the heat wave has passed out from the mass, if cooling, or into the mass, if heating; and which direction is necessarily that of least pressure within the mass, the pressure being that due to distortion or change of form, by contraction or expansion. As matter of observation, this is found to be the longest axis of the crystal in metals.

But, although not ascertainably the optic axis in metallic crystals, future investigation will most probably show, through such transparent bodies as assume in mass the same crystallometric arrangement, that the principal axis, as the term is used by me, has direct relations to the optic axis.

It is certain that it must have immediate relations to the axes of elasticity of Fresnel, which again are in-direct connexion with the optic axes, as Savart has shown. The relation of these latter to local or unequal pressure within the mass has already formed the subject of masterly investigations by Seebeck, Biot, Fresnel, Brewster, and others; and the analogies between the optic effects due to pressure and to change of temperature have been lucidly pointed out by Sir John Herschell, who has well explained that in heating or cooling masses, such internal strains or pressures are produced by expansion or contraction as reduce the proximate cause of the phenomena simply to one of pressure; heat itself having (as inferable from those facts) no specific action on the crystalline arrangement, but being merely the means through which internal and unequal pressures are produced. Mitcherlich's facts, long since ascertained, as to the unequal expansion of crystals in certain systems in different axes, even when uniformly heated, indicate unequal elasticity in their respective axes, as well as unequal resistance to the transmission of the heat wave; the latter fact—the inequality of conducting-power of crystalline bodies in different axes—

is sustained by the researches of Senarmont ("Annal. de Chim." 3 ser. xxi. 457; xxii. 179; xxviii. 279), in papers of the highest interest. He even found that unequal pressure in homogeneous uncrystallised solids, altered their conducting power in different directions.

These mutual relations are elucidated in Sir John Herschell's article Light, "Encyc. Britt." vol iv; arts. 1000, 1085 to 1097, 1113. They form at this moment the frontier and vantage ground of future conquest at once in physics and chemistry, (see also Maxwell's Papers on Elasticity, and on Faraday's Lines of Force, "Camb. Phil. Soc. Trans." December 10, 1855,)

It has been questioned to me how far the fundamental fact is established, that iron, in its several conditions of cast iron, steel, and especially of malleable iron, is truly crystalline at all; whether it may not be possible that the texture of a long, silky-fibred bar of rolled wrought iron is due simply to the extension and drawing out, long and fine, of a heterogeneous mixture of amorphous metal, and of included and uniformly distributed "cinder" (*i. e.* oxides, silicates, and carburets), which might be supposed to form together the mass as first withdrawn from the refinery or balling-furnace, much like as a mass of bird-lime and dry clay, diffused through it, would probably roll or draw out.

I cannot admit the force of the objection, or of the analogy.

All the evidence we possess is in favour of iron having a truly crystalline structure. This is the structure of all so-called elementary bodies, and assumed with distinctness (*cæteris paribus*) in proportion as they approach to chemical purity; not only the analogy here, but that nearer with all other metals, would be broken by such assumption, the crystallizing power being evidenced in all, though developed with very different facility, still in an unbroken chain, from bismuth and antimony, down to whichever may be held most difficult to obtain in crystals from fusion. "But there is

positive evidence of the power of cast-iron, of steel, and of malleable iron to assume the crystalline structure. The form of the integrant crystal is obvious; perfect crystals may be isolated; they possess the property of distinct cleavage in well-developed instances (Wöhler); and the fresh surfaces, often of great size, possess the perfection of plane and of polish that crystallization can alone confer. Other less broad and obvious characteristics, such as difference of resistance to the action of menstrua in different axes, might be urged. Or again, the difference of elasticity of (chemically the same) iron in different states of development of the crystallization of the whole; and difference of elasticity in different axes in the same mass, following observable differences in the prevailing directions of the crystalline axes.

In a word, there appears no more good reason to doubt the true crystalline arrangement of the molecules of iron than there would be to doubt that an isolated octohedral crystal of native gold was truly a crystal, because, by the blow of a hammer, we can flatten it into a spangle. The masking circumstance is alike in both cases. Metallic crystals are all more or less malleable; they are, therefore, susceptible of distortion (to almost any extent, in the most malleable metals) and of re-formation, without further external change in the mass.

But an additional argument may be drawn from Professor William Thompson's views as to the nature of the forces concerned in thermo-electric currents, from which it would seem to follow that iron, or any other body in which a thermo-electric current can be excited, can have none other but a crystalline arrangement. (Thompson, "Dynamic Theory of Heat", *Phil. Mag.* 1856).

In addition to the several examples quoted of the arrangement of crystalline axes perpendicular to the bounding planes of the solid, I would remark a very interesting one, given by the late Professor Daniell, "*Elem. of Chem. Phil.*," sect.

117, p. 88:—If a parallelopiped of tin—hammered or cast, matters not—be placed in mercury for some time, the latter is absorbed gradually: it enters the mass by successive plane couches, parallel to its surfaces; expansion is produced in the planes of these couches, and hence lines of least pressure perpendicular to the same. After a time, the parallelopiped is found split up into six pyramids, by planes penetrating from its edges, and intersecting within it,—their bases being the original sides of the solid; and each of these pyramids is found composed of crystals, whose longest axes are arranged perpendicular to the original sides, and parallel to each other; and into these integrant crystals each pyramid may be subdivided.

Here is a case in which chemical change—resulting in the formation of, no doubt, a definite amalgam—has resulted, owing to the peculiar circumstances of its formation in a state of crystalline aggregation, similar to that which mere change of temperature would have induced in the parallelopiped of tin, had the latter been large enough for internal strains to have so arisen.

Again, the following curious experiment, made by myself several years since, but not previously published:—If a portion of “Muntz patent yellow sheathing-metal” in the state in which it is used in common for ship’s sheathing, bolts, &c. namely, in which it is tough, malleable, extremely flexible, and endowed with a distinct fibrous arrangement in the directions in which it has been laminated or rolled—if of this a small rod, or a narrow slip, be cut from a sheet, and plunged for a moment or two in a tolerably strong solution of nitrate of mercury, and then withdrawn, washed, and wiped dry, it will be found that it has almost instantaneously become rigid, and so brittle that it may now be broken into short bits between the fingers, whereas previously, reiterated bending backwards and forwards between the hands would have with difficulty broken it at all.

The surface of the metal is found slightly amalgamated ; its fractures present crystalline planes, penetrating the solid in directions perpendicular to its faces ; and, on examination of the fracture with a lens, an extremely superficial, but real, penetration of the mercury between the surfaces of the crystals will be observed to have occurred.

The conditions here are varied. The phenomena occur with much greater, indeed with truly remarkable, rapidity, the transmutation from toughness to brittleness being instantaneous ; but the results, and their explanation, are the same as in Daniell's experiment,

Chemical change, then, does not prevent this inversion of crystalline axis ; on the contrary, if it induce the required condition of internal strain, it may produce the same crystalline arrangement that heating, or cooling, or local pressure can do.

Mineralogy and lithologic geology are full of examples of the play of these crystalline forces under the influence of pressure due to gravity, or to change of temperature ; and some of its obscurest phenomena are yet destined to receive light from the application to them of the general law enunciated in the text.

What geologist is there who has not observed, that the integrant crystals, forming the mass of quartz and other such thin veins in igneous rocks, are all arranged in lines perpendicular to the bounding planes of the original fissure—the lines of least pressure in the mass, as it was heated or cooled by the surrounding rock ?

Upon a greater scale, we find the metamorphic crystals of changed rock adjacent to dykes of igneous rocks—as the chalk penetrated by trap in Antrim,—stretching away from the walls of the dyke in lines perpendicular thereto ; and

the arrangement of the trap, so far as it is crystalline at the surfaces of contact, obeying the same law. In Scotland, coal converted naturally into coke, by intrusion of a trap-dyke, assumes the pseudo-crystalline structure known of it in planes of fracture perpendicular to the bounding planes. Perhaps even the yet unsolved mystery of the structure of columnar basalt may find its key and solution,—not *in* this law, but by views which it shall suggest; as well as the molecular conditions, upon the physical action of which the lamination and cleavage of the slaty and other rocks of apparently perfectly homogeneous material has depended; the directions of the pressures concerned in which Mr. Sharp has developed with so much ability.

The navigator in high latitudes has long been familiar with the dreaded fact, that the thawing iceberg, as it floats upon the ocean into warmer latitudes, often suddenly—without apparent external cause, or by any that shall produce the slightest vibration, such as the firing of a gun—splits up, and parts asunder into enormous spiriform masses, whose bounding planes are generally nearly, or quite, perpendicular to the surface of the sea, and which fall with fearful commotion, and stretch their lengths upon the bosom of the deep. The same law has acted here upon a still vaster scale: the whole berg, reduced nearly to its melting-point, has received, by conduction from the ocean beneath, and from the air above, its heat in directions mainly vertical, and its splitting planes are so likewise; for the directions of greatest internal strains are, on the whole, horizontal. Its long fragments, if large enough, obey the same law, but in directions now at right angles to that in which it acted upon their parent berg. We may even imitate all these phenomena, upon a small scale, by heating a block of American ice slowly, by one of its flat surfaces, upon a heated plate of metal or of water; or we may observe them in play in the cross fractures of the thick ice of every pond, as it becomes rotten, and breaks up at the thaw.

The Ordnance Select Committee consider that the question as to what number or proportion of Martin's Liquid Iron Shells should be supplied for each 10-inch gun, 8-inch gun, and 68-pounder, in Coast defences, is one which can best be settled by the Special Committee, under Colonel Lake, Royal Artillery, which is now engaged in revising the Confidential Circular of 1853, on the subject of armaments, and, therefore, abstain from expressing any opinion upon it.

With reference to the supply of cupolas. As the number of cupolas required will depend upon the number of and calibre of the shells liable to be filled, no rule can be given for their supply, and the Committee consider it sufficient, to recommend that one cupola of the pattern last tried at Shoeburyness, but with the improvements subsequently authorized (24. 5. 60. 79. M. 223), be furnished as early as possible to each detached work of Coast defence at Home, and to each fortress Abroad, leaving further supplies to the discretion of His Royal Highness the Commander-in-Chief, when the number of Shells has been determined.

The 8-inch Martin's shells filled, weigh about 59 lbs, and the 10-inch shells, about 115 lbs, neither of which weights agree with those of any other projectiles of those calibres, and the charges being also reduced, special Range or Practice Tables for them will be required. The data in possession of the Committee at present are not sufficient to furnish the proper elevations for different ranges, but they will do so hereafter.

(Signed) J. ST. GEORGE.

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*The following are the results of experiments made with Mr. Martin's Shells filled with Liquid Iron.*

1st. April, 1856.—Eleven shells were fired from a 95 cwt. 68-pounder, with charges from 10 lbs. to 6 lbs. Eight rounds at a wooden bulkhead, and three rounds at masonry. Range, 660 yards.

The Shells were carefully gauged before and after filling.

	Inches.	Expansion.
Diameter of shell before filling.....	7.87	„
„ one minute after filling .....	7.88	0.01
„ eight minutes after filling....	7.885	0.15
„ one hour after filling.....	7.95	0.08

The wooden bottom commenced charring 3<sup>m</sup> after the shell was filled, bottom in flames in 15<sup>m</sup>; of the eight shells fired at the wooden bulkhead with 8lbs. charges, six broke up and fired the bulkhead more or less, one struck short and entered the bulkhead *en-ricochet* and set it on fire as a red hot shot. This shell had been filled one hour when it was fired, and although it had been rolled about, its shape remained unaltered.

One shell filled 6<sup>m</sup> and another 4½<sup>m</sup>, appear to have been the most effective in this practice.

At the eighth round the bulkhead was burned down. Three rounds were fired at masonry with 10, 8, and 6lbs. charges; the shells broke and the iron was seen streaming out in every direction.

9th December, 1856.—The bulkhead fired at on this occasion does not seem to have been constructed in a proper manner; the supports were much shattered by the *first* shell, and the whole of the bulkhead above the shores was knocked away by the *second*.

Twelve shells were fired with 10lbs. charges. Range, 600 yards—A shell was filled to test its expansion, it was gauged as follows :—

	Inches	Expansion.
Diameter when cold.....	7.835	„
„ 15 <sup>m</sup> after filling.....	7.860	0.025
„ 30 <sup>m</sup> after filling.....	7.865	0.030
„ 45 <sup>m</sup> after filling.....	7.860	0.025
„ one hour after filling...	7.855	0.020
Greatest expansion.....		0.030



After the *twelfth* round the firing was discontinued in consequence of the unsuitable construction of the bulkhead.

Of the twelve shells fired, five struck the bulkhead, four broke, a sheet of flame was observed when they broke, but they failed to ignite the bulkhead. The shell which struck without breaking had been filled 5<sup>m</sup>, but it appears merely to have grazed the upper corner. Three shells grazed short and broke; four missed the bulkhead.

The wind was blowing strong across the range during the practice.

One of the shells found whole at the butt, having been covered with chips and broken portions of the bulkhead, set fire to them in about two minutes.

The shells that broke and showed the greatest sheet of flame had been filled from 5<sup>m</sup> to 7<sup>m</sup> 30<sup>s</sup>.

4th April, 1857.—A bulkhead was constructed for this experiment, representing the section of a 36 gun frigate, both sides of the ship and part of the main and upper decks being included:—

Nine shells were fired from a 68-pounder, 95 cwt., two at 600 yards, charge 6 and 8lbs., time filled 9<sup>m</sup> and 12<sup>m</sup>, section on fire in two places, but easily extinguished by a few buckets of water, large pieces of the iron from the shell which had been filled 12<sup>m</sup> were found laying on the deck,—they had taken the form of the shell. Two at 600 yards, 6 and 80lbs. charges, time filled 13<sup>m</sup> and 15<sup>m</sup>; these two shells appear to have lodged without breaking, the first in the butt after *ricochet* the second in the section. Smoke was observed coming up the hatchway after this shell struck, but it probably acted as a red hot shot.

Two at 600 yards, same charges, time filled 12<sup>m</sup> and 9<sup>m</sup>, both these shells struck the section. It is not stated that they broke up, but the last one must have done so, as a great deal of smoke was apparent, and on examination the section was found to be on fire in several places, but most

seriously in the rear bulkhead, into which it was necessary to open a passage with axes and then apply the fire engine to extinguish the fire.

Two rounds at 400 yards, charge 6lbs., time filled 10<sup>m</sup> and 12<sup>m</sup>, both these shells struck the section and it was found to be on fire in three places. No note is made of their having broken up in the report of practice, but it seems likely they did.

Two red hot shot were fired with 6lbs. charges, at 600 and 400 yards; they both passed through the section and lodged in the butt.

One of Mr. Martin's shells was fired at the bulkhead covered with iron plates at the 400 yards range, the shell on striking broke to pieces; the iron was scattered laterally to a distance of 150 yards. It rained during the experiment, and the section was very wet. Mr. Kershaw's cupola was used for melting the iron: time from lighting the fire to running the metal was 50 minutes: the cupola being in full work, and fresh metal thrown in, will run in 20 minutes.

29th May 1857.—Twelve of Martin's shells, filled with liquid iron, were fired at the section of a frigate, distance 600 yards, charges 6 and 8lbs., from a 95 cwt. 68-pounder gun:—

Three common shells filled with molten iron and three red hot shot were also fired. Seven of Martin's shells struck the section, time filled from 8<sup>m</sup> to 16<sup>m</sup>. Three that had been filled 8<sup>m</sup>, one with 6lbs. and the other two with 8lbs. charges, broke and ignited splinters of timber. Two that had been filled 12<sup>m</sup> and 14<sup>m</sup>, fired with 6lbs. charges, passed through front bulkhead without breaking, lodged in the rear bulkhead, igniting the timbers.

Two filled 14<sup>m</sup> and 16<sup>m</sup>, with 8 and 6lbs. charges, passed through both bulkheads into the butt without breaking.

Five filled from 9<sup>m</sup> to 19<sup>m</sup> missed and went into the butt, charges 8 and 6lbs.

The three common shells filled 6<sup>m</sup>, 5½<sup>m</sup>, and 3<sup>m</sup>, with 6 and 8lbs. charges, passed through both bulkheads without breaking.

Of the three red hot shot, with 6lbs. charges, two passed through both bulkheads without firing them, one missed.

2nd September, 1857.—Eight of Mr. Martin's shells filled with liquid iron were fired at the same section, with a charge of 6lbs. from a 95 cwt. 68-pounder, distance 600 yards:—

The first shell was filled 7<sup>m</sup> before firing, the other four shells 2<sup>m</sup>.

They all struck the section and broke; smoke and flames were observed to issue from the section after each shell broke up. After the fifth round, the fire in the section was observed to be getting so much a-head that it was decided to cease firing for a time and put it out. An engine provided for the purpose was employed; but the efforts made were unavailing, and the entire section was destroyed.

16th November, 1859.—Experiments were carried on at Shoeburyness, at the section of a 36-gun frigate erected for the purpose, gun 56 cwt. 32-pounder.

Kershaw's cupola, and the small steam engine used at former experiments, were provided for heating the metal: the cupola having been heated, the metal was put in and was ready for running in 20 minutes. Twenty-seven of Martin's shells filled with molten iron were fired.

The first *five* rounds were fired with 8lbs. charges, the time filled being 7<sup>m</sup>, 8½<sup>m</sup>, 10<sup>m</sup>, 11<sup>m</sup>, and 13<sup>m</sup>; they all seem to have broke on striking—the last three shells were red hot when put into the gun. The section was examined after the fifth round, and found to be on fire; the fire was easily extinguished by the aid of a small fire-engine; some of the liquid iron having run down between the timbers, it was

found necessary to cut some of the wood work away to get at it with the hose. The fifth shell, which had been filled 13 minutes, broke on striking, but the contents were quite solid.

Six more shells were fired with 6lbs. charges; the first one filled 1<sup>m</sup> broke at the muzzle of the gun; the other *five* filled from 2 $\frac{1}{4}$ <sup>m</sup> to 3 $\frac{1}{4}$ <sup>m</sup>, broke on striking the section. The charge was then reduced to 6lbs. The *first* shell fired with this charge and filled 1<sup>m</sup> broke at the muzzle, another shell filled 2<sup>m</sup> broke at the muzzle. Fourteen more shells filled from 2 $\frac{1}{4}$ <sup>m</sup> to 4<sup>m</sup> were fired with 6lbs. charges. Thirteen of them struck the section and broke up, one grazed short and broke on graze.

The bulkhead was examined after the *fifteenth, twenty-fourth, and twenty-seventh* rounds; the section had not been set on fire.

	lbs.	ozs.
6-inch shells empty weighed.....	12	10
„ filled „ .....	23	2
	Inches.	
Diameter empty.....	6	153
„ filled.....	6	183.

15th December, 1859.—Fifteen Martin's shells filled with liquid iron were fired at the section of the 36-gun frigate, at Shoeburyness, from a 32-pounder, 58 cwt. gun, distance 400 yards:—

Fifteen rounds were fired with 6lbs. charges, time filled 9<sup>m</sup> to 3<sup>m</sup>. One shell broke up at the muzzle filled 3<sup>m</sup>. Twelve hit the section, three of them on the part covered with iron plates; most of those that struck broke up. After the *fourth* round, the section was on fire between the timbers; the fire was easily extinguished. It was again on fire after the *fifteenth* round, but was easily extinguished; axes had to be used to get at the fire between the timbers. The contents

of one shell were found entire on the beach, and fired splinters immediately on being placed in contact with them.

Three of Martin's 8-inch shells filled with molten iron, were then fired from a 68-pounder gun, 95 cwt., range 400 yards, charge 8lbs., time filled 5<sup>m</sup>, and 8<sup>m</sup>, 4<sup>m</sup>. The first shell set the section on fire, but it was easily extinguished; the *other two* shells grazed short and burst on graze.

16th December, 1859.—Ten of Martin's shells, filled with liquid iron, were fired from a 32-pounder, 58 cwt., charge 5lbs., at the section of the frigate distant 400 yards; time filled from 3<sup>m</sup> to 8<sup>m</sup>.

All these *ten* shells appear to have struck the section, and *all* broke up but *one*; the section was slightly on fire but was easily extinguished.

Ten shells filled as before were then fired at the section with 4lbs. charges, from the same gun, time filled from 4½<sup>m</sup> to 2¼<sup>m</sup>; they all struck the section. Three struck the part covered with iron plates, and broke up; six struck the wooden portion of the section and broke, and one that had been filled 2¼<sup>m</sup> passed right through the section. The section slightly on fire, but easily put out.

Twelve shells filled as before were then fired from the same gun, with 6lbs. charges, at 800 yards; to test precision of fire. Two targets were placed on the sea wall, it being considered desirable to preserve the remains of the section for further experiments.

Two of these shells filled 3<sup>m</sup> broke in the gun.

The practice with the remainder was as good as with round shot, charge 6lbs, elevation 1¼°.

The supply of metal was good throughout these experiments. The metal ran 20<sup>m</sup> after being put into the cupola.

27th April, 1860.—Twenty of Martin's 10-inch shells, filled with liquid iron, were fired, at Shoeburyness, at the

section of the 36-gun frigate, distance 400 yards, from a 10 inch gun of 85 cwt., with charges of 8lbs:—

The *first six* were fired at the part of the frigate covered with iron plates of various thickness.

*Three* struck iron plates of 1½ in. and 2 in., time filled 11<sup>m</sup>, 7<sup>m</sup>, and 7½<sup>m</sup>. They all broke up, breaking away and forcing in large portions of the plates, much of the broken shells and molten iron passing through into the section and setting it on fire. One filled 8<sup>m</sup> struck the top of rear bulkhead, and fell unbroken into the sea. One filled 8<sup>m</sup> struck the right edge of the rear of the section, and broke up, setting it on fire; portions of the metal spread to 50 yards on each side. One filled 8<sup>m</sup> passed through the hole made by a former shell, driving in a large piece of plate; the shell broke up, but did not set fire to the section.

Seven were then fired at the wood work; the whole of them struck the section. Two filled 10<sup>m</sup> broke up and set the section on fire. One filled 10<sup>m</sup> grazed the section and fell into the sea unbroken. One filled 11<sup>m</sup> passed through both sides of the section without breaking. Two filled 8<sup>m</sup> struck section and broke up, setting the rear of the section on fire. One filled 8<sup>m</sup> struck the section and passed through without breaking up, although a large hole was knocked in it. It was recovered out of the sea, still retaining more than half of its contents.

Seven rounds were then fired at the iron plates, the wooden portion of the section being so much shattered as to offer insufficient resistance to break the shell. Four filled from 8<sup>m</sup> to 10<sup>m</sup> struck the plates, broke up, and set the section on fire. One filled 11<sup>m</sup> struck the shattered timber and passed into the sea unbroken. The practice does not record any particulars respecting two that were filled respectively 7<sup>m</sup> and 9<sup>m</sup>, save that the *first one* struck the plates. The fire in the section was on each occasion easily extinguished.

After the cupola was heated, the metal was put in and ran in 20<sup>m</sup>.

The whole of the above practice was carried on by the Ordnance Select Committee in their presence.

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*The following Practice has been carried on at Portsmouth, under the direction of Captain Hewlett, of H. M. Ship "Excellent."*

15th September, 1859.—Eleven of Martin's 8-inch shells, filled with molten iron, were fired from a 95 cwt. 68 pounder, at the "Serpent," brig, distance 750 yards, charges 8 lbs. and 10 lbs.

Captain Hewlett remarks "that the brig had been so shattered with shot, and in so rotten a state, that for want of resistance to break the shells, I hardly anticipated any success in the experiments, which, however, have proved satisfactory so far as they have gone, inasmuch that the only *two* shells which struck the brig in anything like a sound part, broke up and set fire to her."

Of the eleven shells fired, two filled 9<sup>m</sup> and 5<sup>m</sup> 30<sup>r</sup> struck the brig in sound part, broke up, and set her on fire. One filled 6<sup>m</sup> 30<sup>r</sup> hit unsound part *en-ricochet* did not break. Three filled 10<sup>m</sup> 5<sup>r</sup>, 14<sup>m</sup> 6<sup>r</sup> and 9<sup>m</sup> struck unsound wood and did not break. Four filled from 6<sup>m</sup> to 15<sup>m</sup> 30<sup>r</sup> missed. One filled 45<sup>m</sup> broke in the gun, charge 10 lbs. The two last shells 15<sup>m</sup> 30<sup>r</sup> and 45<sup>m</sup> were fired with 10lbs. charges, the remainder with 8lbs.

24th November 1859.—Five of Martin's 8-inch shells, filled with molten iron, were fired from a 68-pounder, 95 cwt., at the "Undaunted" frigate, distance varying from 200 to 350 yards. Four of them struck direct, time filled 4½<sup>m</sup> to 5<sup>m</sup>; they all broke up, setting the ship on fire. One struck *en-ricochet*, passed through the outer lining into the timbers, and lodged without breaking up, set fire to the ship, but the

fire was easily extinguished. The fifth shell, fired at 350 yards, with 8 lbs. charge set fire to the ship so effectually, that, in spite of all endeavours to extinguish it, the fire gained ground so rapidly, it was found necessary to sink her before it could be extinguished.

The "Stork," gun boat, brought her fire engine to play upon the fire, and in addition, there was a fire engine on board. The men were obliged to abandon this latter after a short time, the heat of the fire became so great.

*Abstract of Remarks made on former occasions.*

Sub Committee B. of the late Ordnance Select Committee report very favorably of the molten iron shells after the practice on the 1st April, 1856, observing that "they consider the practicability of Mr. Martin's proposal, and the efficacy of the non-conducting material used to coat the interior of his shells, to have been fully established by the experiments made, &c."

On the 10th February, 1858, the late Committee reported that "it appears these shells are easily filled, that they are more easily handled and placed in the gun than hot shot can be, that in using them there is less danger of bursting the gun than with hot shot, and that their incendiary power exceeds that of hot shot."

Captain Hewlett reports in a letter dated the 17th September, 1859, addressed to the Secretary of the Admiralty, after trial against the "Serpent," brig:—"I am of opinion that these Shells, filled with liquid iron, are more certain and destructive in their incendiary effects than red hot shot, or any other missile at present known."

Again, on the 25th November, 1859, a letter addressed as before: "I now beg to call their Lordship's attention to the fact, that this trial appears to be a very conclusive one, as to the immense effect and destructiveness of molten iron, when used against wooden-ships;—each of the five shells that



struck the vessel fired the ship, more or less, and the effect was, that she was obliged to be sunk to prevent her being totally destroyed by fire."

(Signed) J. ST. GEORGE.

*Summary of Experiments.*

Date.	Nature of Gun.	No. of Shells fired.	Total.
1st April, 1856.....	68 pounder	11	} 8 inch shells, 68.
9th December, 1856.....	"	12	
4th April, 1857.....	"	9	
29th May, 1857.....	"	12	
2nd September, 1857.....	"	5	
15th September, 1859.....	"	11	} H. M. S. Excel- lent.
24th November, 1859.....	"	5	
15th December, 1859.....	"	3	} 32 pounder shells, 64. 10 inch shells, 20.
16th December, 1859.....	32 pounder	22	
27th April, 1860.....	10 inch	20	
16th November, 1859.....	32 pounder	27	
15th December, 1859.....	"	15	

In all 152.

Military Notes, written at Secunderabad. India. by W. B. E. Ellis, Lieutenant Royal Artillery.

PREFACE.

In the following notes on Artillery, I have endeavoured to combine what I think good, both in old and in existing systems, with such modifications as I deem would be for the benefit of the Service.

I venture these Notes, in the hope that all suggestions contained therein will be read in the same spirit in which they were written, namely: an ardent desire for the improvement of the Service.

SECUNDERABAD }  
January 17th 1860. }

W. B. E. ELLIS,  
Lieutenant, Royal Artillery.

## CHAPTER 1.

## NOTE 1.

## ON ARTILLERY.

Artillery strictly speaking consists of two branches only, namely,

1. Field Artillery.
2. Garrison or Siege Artillery.

It is necessary however that some Field Artillery should be able to manoeuvre with Cavalry.

The Artillery intended to act with Cavalry should be called Horse Artillery, and should possess very great mobility.

It is also necessary that nearly all Field Artillery should be able to manoeuvre rapidly, but a few pieces of Heavy Metal are also of the greatest importance in the Field.

“Organization”

Therefore the whole of the Field Artillery may be classified as follows:

1. Horse Artillery.
2. Light Field Artillery.
3. Heavy Field Artillery.

However, there must be so much difference between the organization of Horse Artillery and that of the remainder of the Field Artillery, that I believe it to be the most beneficial to the Service to divide the whole Artillery Service, permanently, into the following three branches namely,—

1. Horse Artillery.
2. Field Artillery.
3. Siege Artillery.

Each of these Branches of the Artillery should be composed of Batteries, which should be numbered from one upwards in each branch.

“Officers”

Officers, on obtaining their Commissions should be allowed to name the branch they wish to join, and as all Officers of Artillery should be fit for

mounted duties, they should then be appointed according to seniority.

Officers whose appointments are confirmed should not, necessarily, leave the Horse Artillery on promotion.

Men should be enlisted distinctly,  
for the Horse Artillery,  
for the Field Artillery,  
or for the Siege Artillery.

Those Men who are enlisted for the Horse Artillery, and those also who are enlisted for the Field Artillery, should be liable to be transferred to the Siege Artillery, if found unfit for mounted duties after one year.

If such men are unfit for Siege Artillery they should, of course, be discharged.

If after some years service, men should be found unfit for mounted duties, they should be transferred to the Siege Artillery, or if not too old and stiff they might serve with advantage in the Heavy Field Batteries.

Under no other circumstances, than those above alluded to, should any transfer of men take place from one Branch of the Artillery Service to another.

"Men."  
In the Horse Artillery, and also in the Field Artillery the men should be divided into Gunners and Drivers.

In the siege Artillery the men should all be Gunners.

In the Horse Artillery and also in the Field Artillery, the Gunners should be trained Drivers, and the Drivers should be trained Gunners,

The men in every Branch of the Artillery, should be trained to every variety of Ordnance.

The Gunners for the Horse Artillery and those also for the Field Artillery should be of a moderate size and weight

The drivers for the Horse Artillery and those also for the Field Artillery should be small and light, but powerful enough to work a gun.

The Gunners for the Siege Artillery should be both large and heavy.

“ Draught”                      The system of Draught throughout the Artillery Service should be shafts and two horses abreast,

“ Horse Artillery system.”      The Horse Artillery should be armed with  
9 Pdrs.                      of 10 cwt.  
and 24 Pdr. Hrs. of 10 cwt.

and there should be 8 Horses in both the Guns and Waggons,

The detachment system should be retained.

The Limber Gunners should however ride on the two off centre horses.

The Kits should be in Valises, and every man should carry his kit on the Horse he rides.

The Valises should be only large enough to contain what a man requires to have with him at all times.

The remainder of the Kit, which may be termed the Reserve Kit, must be with the Baggage.

The off-leaders of both Guns and Waggons should carry spare saddles.

“ Light Field Artillery system.”      The Light Field Artillery should be armed with

9 Pdrs.                      of 13½ Cwt.  
and 24 Pdr Horse of 12½ Cwt-

and there should be 8 horses in both the Guns and Waggons.

The Carbine should be abolished throughout the Artillery Service.

The Drivers in the Horse Artillery, and also the Drivers in the Field Artillery should have a Revolver. •

## ADAM'S PATENT.

The Gunners throughout the Artillery Service should have a light Cavalry Sword.

The Non-Commissioned Officers should have a Light Cavalry Sword only.

The Knapsack should be abolished in the Field Artillery, and replaced by a small Valise.

Drivers should carry their Valises on the near Horses.

Gunners should carry their Valises on the Off-Horses, and on the Carriages.

All the Off-Horses (except the Shaft Horses) should have Saddles.

The Waggon should never manœuvre with the Guns.

When the Battery moves at a walk, the Gunners should walk, but when the Battery is required to move at a trot, the following method of carrying the Gunners should be practised.

2 Gunners should mount on the Limber.

3 Gunners should mount on the Off-Horses

The Serjeant in charge of a sub-division should be the No. 1 of his own Gun and he should be mounted.

Two other mounted non-commissioned should always accompany each Gun.

There would then be with each gun, as follows,

3 Non-Commissioned Officers.

5 Gunners

4 Drivers.

Total...12. Men.

These 12 men would be able to accompany the Gun at any pace at which Light Field Artillery could be required to move.

“Light Field Artillery system.” Light Field Artillery should never manoeuvre faster than a round Trot.

The following single exception may be made to this rule.

“When it is necessary to obtain the greatest possible speed, for some great object.”

According to the above system, should casualties occur among the Drivers when the Battery is in motion, the Gunners would be able to replace them.

Also in case of casualties among the Gunners when the Battery is in Position, the Drivers of the two centre Horses would be available.

In case of Heavy loss, assistance would arrive from the remainder of the Battery, or the Ammunition Column, as it may be called.

“Heavy Field Artillery system.” The Heavy Field Artillery should be armed with Iron 32 Pr. Guns of 25 Cwt., 6 feet long, and there should be 8 Horses in the Guns and 6 in the Waggon.

The off-leaders of both Guns and Waggon should carry a spare Saddle.

The remaining off-Horses should have Pads.

Heavy Field Artillery would seldom be required to move faster than a walk, therefore the Gunners should walk, and two mounted Non-Commissioned Officers per Gun will be sufficient.

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NOTE 2.

ON THE ARMAMENT FOR HORSE ARTILLERY.

*Extract from a letter written by COLONEL SIR ALEXANDER DICKSON, D. A. GENERAL Royal Artillery, Woolwich, April 8th, 1834.*

ARMAMENT FOR THE HORSE ARTILLERY.

“Armament for Horse Artillery.” “I am decidedly of opinion, the armament for all the Horse Artillery in India, should be with light 6 Pdr. Howrs.; these being perfectly

efficient pieces, capable of very rapid movements, and carrying with them a large proportion of ammunition, that would enable the Horse Artillery effectually to cover the movements of an Army, particularly when in opposition to large masses of active Cavalry."

*Extract from*

The Proceedings of a special Board of Artillery Officers assembled in Fort William, Calcutta, on the 9th July 1836, under instructions from the Secretary to the Government of India, Military Department, for the purpose of taking into consideration and suggesting arrangements for the introduction of Uniformity, as far as may be compatible with the local peculiarities of each establishment, in the "Material" and equipments of the Artillery Branch of the Service, at the several Presidencies of Bengal, Madras and Bombay.

*President*

COLONEL WHISH,.....*Bengal Artillery.*

*Members.*

LIEUT.-COLONEL STEPHENSON,.....*Bombay Artillery.*

MAJOR TENNANT,.....*Bengal Artillery.*

MAJOR CONRAN,.....*Madras Artillery.*

CAPTAIN SETON,.....*Madras Artillery.*

CAPTAIN WHITLIE,.....*Bombay Artillery.*

*Secretary.*

CAPTAIN CARTWRIGHT,.....*Bengal Artillery.*

The Board proceed to investigate the different subjects to which their attention is called in the following Order.

1st.—The Organization and equipment of Troops of Horse Artillery.

2nd.—The organization and equipment of Field Batteries.

3rd.—The organization and equipment of Siege Trains.

## HORSE ARTILLERY.

With regard to Ordnance for Horse Artillery the Board record their opinion as follows—

*Ordnance.*—That the 9 Pdr. Guns in length 5 feet, weighing 6 Cwt.; and the 12 Pdr. Howitzers in length 3 feet 9·2 inches, weighing 6½ Cwt. (being those now in use) are best adapted to the Horse Artillery Service in India".

	lb.	oz.
Charge.—For the 6 Pdr.....	1	8
for the 12 Pdr. Howitzer.....	1	4

N. B.—Major Tennant, differing in opinion with the other Members, as to the calibre of the Ordnance with which Troops of Horse Artillery, should be armed, submits a Minute.

*Extract from*

## A MINUTE BY MAJOR TENNANT.

The Honorable the Court of Directors have founded their orders on the opinion of Sir Alexander Dickson, a high authority I allow in matters connected with the Artillery; but it appears to me that that Officer has recommended the 6 Pdrs. and 12 Pdr. Howrs. for Indian Service, on an erroneous supposition, that from some peculiarities of the service in India, we were unable to bring heavier Guns into the Field.

*"Armaments for Horse Artillery."* If I am correct however, in supposing that this difficulty can be overcome in the same way that it was overcome in England, it seems not unfair to think that Sir Alexander Dickson himself would have altered his advice.

The Honorable Court are in error, I also think, when they state that 9 Pdrs. were only used at the Battle of Waterloo, because it was a battle of Position; I admit that this battle was one of position only, but I cannot conceive that the Duke of Wellington, when preparing for the Campaign in Belgium, contemplated this event, and provided solely with



a view to it; but rather, that he substituted that nature of Ordnance in his Field Batteries which had been, in his judgment, found most effective against the French 8 Pdrs. in his previous Campaigns; in this he evidently agreed with Officers of the Royal Artillery.

Sir Alexander Dickson himself has told us in reply to some questions put to him on this subject from Bengal—

“ That the 9 Pdr. is a most efficient gun, and I have no doubt will always be the Piece most used by us on continental service.

Nine Pounders of 13 Cwt were the favorite Guns in Spain in the latter Campaigns, and with the exception of the Horse Artillery, and one Battery of long 6 Pdrs., all the rest were 9 Pdrs.

At Waterloo both the Horse and Foot Artillery almost all had 9 Pdrs.”

\* Armaments for  
Horse Artillery.” This indicates an increasing partiality for them, until they were at last adopted in the Horse Artillery, and Sir Alexander Frazer in his remarks on the organization of the Corps of Artillery, admits that the change then made was “ Judicious ” and “ that had the Light Pieces been suffered to remain, it might have had a considerable effect on the fortunes of the day.”

The state and relative utility of such of the troops as retained their lighter Guns, and were in exposed situations, very strongly corroborates this idea.

Subsequently in consequence of this experience, the Select Committee of Artillery Officers at Woolwich, proposed to have all Field Batteries on foreign Service, both in the Horse and Foot Artillery composed of 9 Pdrs., recommending however that as 6 Horses had not been found sufficient for them in Spain, 8 Horses might be allowed.

From all this, I entertain the belief that 9 Pdrs. were adopted in the Horse Artillery at Waterloo from a convic-

tion acquired on active service, that they were best adapted for general purposes, and that they were only laid aside when on Home Service, during the Peace which followed, contemplating (as the Woolwich Select Committee prescribes for equipments of this nature) only for the service of fixed Districts, but with the acknowledged proviso, that in the event of actual warfare, they must be placed on the foreign service scale.

I have not a doubt therefore, that for Foreign Service, 9 Pdrs. are now, as they were then, preferred by the Royal Artillery; and I think, we shall not only find no peculiar circumstances in Indian warfare, to lead us to a different conclusion, but even such as would strongly recommend the same.

Sir Alexander Dickson further gives his reason for recommending 6 Pdr. Guns and 12 Pdr. Howrs. "that they are very efficient in dispersing large bodies of Cavalry," apparently misled by an impression, that this was the principal use of Field Artillery in India,

But we have unfortunately found that the Native Powers can bring heavy and efficient Artillery against us; and in no instances I believe, when they have done so, has our Field Artillery been able to cope with them.

"Armament for Horse Artillery." The result of the battles of Assaye, Laswarree, Putpergunge, and Mahidpoor are quite satisfactory proofs to my conviction, that our Field Artillery has always been heretofore nearly useless when so opposed, and one reason of this is recorded to be the superior calibres of the Enemy's Guns.

Other instances of minor importance, have not been wanting to my own observation to prove that a heavier gun than a 6 Pdr. is often very desirable, and sometimes when detached with few Guns only, and no other assistance at hand, abso-

lutely necessary; and on the whole my persuasion is, that nothing short of the impossibility of bringing them into the Field should prevent, if it was left to our own choice, our recommending the 9 Pdrs. to be generally used in our Batteries, Horse and Foot.

I am ready to admit with my Colleagues that if we are restricted to 6 Horses in draught, it is a fatal objection to the use of 9 Pdrs. but I am not aware of any objection to use 8 Horses in India as well as in England, nor do I conceive that the expense of doing so would be unreasonable.

I conceive then, that it is quite possible to bring 9 Pdrs. into the Field with our Horse Artillery, and that the advantages they possess over 6 Pdrs. would warrant the expense of doing so.

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*Extracts from*

NOTES ON THE MAHRATTA WAR.

*“ Published by Authority.”*

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ASSAYE.

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“ The British Artillery had opened on the enemy at the distance of 400 yards, but General Wellesley, finding that it produced little effect on the Enemy’s  
 “ Armament for Horse Artillery.” powerful and extensive line of Infantry and Guns, and that his Guns could not advance on account of the number of Men and Bullocks that had been disabled, ordered his Artillery to be left behind and the whole line to move on.”

The whole line, led by the Major General in person advanced to the charge with the greatest bravery and steadiness, without its Guns, and against a most severe, and destructive fire of round and grape shot, until within a very short distance of the Enemy. Several Officers in General Wellesley’s

Army who had served during the late Campaigns on the Continent of Europe have declared " that it is no disparagement to the French Artillery to say that Cannon were never better served than by the Enemy at Assaye.

The Enemy had on this occasion—

2.....	24 Pdrs.
8.....	18 „
10.....	16 „
3.....	12 „
1.....	10 „
4.....	9 „
3.....	8 „
27.....	6 „
<hr/>	
58	

Besides smaller Guns and Howitzers amounting in all to 98 pieces.

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### LASWARREE.

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At the battle of Laswarree, the British Guns actually engaged numbered,

8 Field Pieces.

10 Galloper Guns.

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18 Total Pieces.

These commenced their fire and continued to advance notwithstanding the superiority of the Enemy's Artillery, both in number and weight of metal; the Cannonade on both sides was extremely severe, the Enemy's Artillery was exceedingly well served.

As soon as the Infantry arrived within reach of the Enemy's Canister shot, a most tremendous fire opened from the Enemy's Artillery.

The loss was very severe and the heavy Cannonade from the Enemy's line was sufficient alone to prevent a regular advance.

The Enemy had—

1.....	18 Pdr.
6.....	14 „
26.....	6 „

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33

Besides smaller Guns and Howitzers amounting in all to 71 pieces.

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### PUTPERGUNGE.

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“ The whole of the British army (when formed) advanced towards the enemy, notwithstanding a tremendous fire of round, grape, and chain shot, until they had reached within one hundred paces of the enemy, when the enemy commenced a heavy fire of grape shot from all their Artillery.”

Lord Lake says in his despatch to the Governor General “ our loss has been very great, but when I consider that we moved on against an immense Artillery of nearly 100 Pieces of Cannon, and many of a very large Calibre, under as heavy a fire as I have ever been witness to, it is no longer a matter of surprise.”

The enemy had—

2.....	20 Pdrs.
5.....	18 „
3.....	16 „
3.....	12 „
15.....	6 „

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28

Besides others of smaller calibre, with Howitzers amounting in all to 68 Pieces.

## MAHIDPOOR.

*“ From Colonel Blacker's Account of the Battle.”*

“ To Sir John Malcolm was given the immediate command of the two Brigades of Infantry destined to the attack of the enemy's left.

The whole of this operation was performed with great steadiness, under a fire of both round and grape shot from several Batteries.

By this time the Horse Artillery were either silenced or dismounted; for their light Pieces were unequal, however well served, to stand against the heavy calibres in their front.”

I consider the arguments urged by Major Tennant in his minute to be so powerful and conclusive, that I only venture to re-echo his sentiments.

“ Armament for Horse Artillery.” I will add however, that the immense increase in the effect of Infantry fire since 1836, the improved construction of Gun Carriages, and the necessity of keeping pace with the improvements in Foreign Artilleries, all point to the advisability of arming Horse Artillery with 9 Pdrs. in preference to 6 Pdrs.

I will now compare briefly the relative advantages and disadvantages of 9 Pdrs. and 6 Pdrs., and also those of 24 Pdr. Howrs. and 12 Pdr. Howrs.

The 9 Pdr. and 24 Pdr. Howrs. I advocate for the armament of Horse Artillery, are the Pieces of 10 Cwt., now used by the Madras Field Artillery—and these are the pieces therefore which I will compare with the 6 Pdrs. and 12 Pdr. Howitzers.

The Madras 9 Pdr. when mounted and equipped, and the Madras 6 Pdr. when mounted and equipped weigh as below,

Madras 9 Pdr.			Madras 6 Pdr.		
Cwt.	qr.	lbs.	Cwt.	qr.	lbs.
35	...	1 ... 24	30	...	1 ... 14

I propose 8 Horses as the Team for the 9 Pdr., and the Team for the 6 Pdr. at present used by the Madras Horse Artillery consists of 6 Horses.

The weights that each Horse would have to draw would be therefore as follows.

Madras 9 Pdr.	Madras 6 Pdr.
Cwt. qr. lbs.	Cwt. qrs. lbs.
4 ... 1 ... 20·5	5 ... 0 ... 7

This shows that each Horse in the 9 Pdr. Team would have to draw less than each Horse in the 6 Pdr. Team by exactly.

$$\text{Qrs. } 2 \dots 14\cdot5 \text{ lbs.} = 70\cdot5 \text{ lbs.}$$

The Madras 9 Pdr. carries on the Limber 32 Rounds of Ammunition, and the Madras 6 Pdr. carries on the Limber and in the axletree Box 50 Rounds of Ammunition, shewing a loss of 18 Rounds per Gun by the introduction of the 9 Pdr.

There would also be an increased expense, by the introduction of the 9 Pdr., of 1 Driver and 2 Horses per Gun and per Waggon.

Comparing the Madras 9 Pdr. with the English 6 Pdr. in the same manner as above, we find, that,

The 9 Pdr. and English 6 Pdr., when mounted and equipped weigh as follows—

Madras 9 Pdr.	English 6 Pdr.
Cwt. qr. lbs.	Cwt. qrs. lbs.
35 ... 1 ... 24	28 ... 0 ... 0

The weights that each Horse would have to draw would therefore be.

Madras 9 Pdr.	English 6 Pdr.
Cwt. qrs. lbs.	Cwt. qrs. lbs.
4 ... 1 ... 20·5	4 ... 2 ... 18 $\frac{2}{3}$

Shewing that each Horse in the 9 Pdr. Team would have to draw less than each Horse in the 6 Pdr. Team by exactly 26½ lbs.

The Madras 9 Pdr. carries as before stated 32 Rounds of Ammunition, the English 6 Pdr. carries on the Limber and in the axletree Box 46 rounds of Ammunition, shewing a loss of 14 Rounds per Gun, in the case of the 9 Pdr.

There would also be the increased expense of 1 Driver and 2 Horses per Gun and per Waggon.

Comparing the Madras 24 Pdr. Hwr. of 10 Cwt., with the Madras 12 Pdr. Hwr. we find—

The 24 Pdr. Hwr. and the Madras 12 Pdr. Hwr. when mounted and equipped weigh as follows:

	Madras 24 Pdr. Hwr.			Madras 12 Pdr. Hwr.		
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
"Armament for Horse Artillery."	37	...	0 ... 0	31	...	2 ... 16

The weights that each Horse would have to draw (attaching 8 Horses to the 24 Pdr Hwr. and 6 to the 12 Pdr. Hwr.) would be,

Madras 24 Pdr. Hwr.			Madras 12 Pdr. Hwr.		
cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
4	...	2 ... 14	5	...	1 ... 2½

Shewing that each Horse in the 24 Pdr. Hwr. Team would have to draw less than each Horse in the 12 Pdr Hwr. Team by exactly—

$$\text{Qrs. 2 ... 16½ lbs.} = 72½ \text{ lbs.}$$

The Madras 24 Pdr. Hwr. carries on the Limber and in the axletree Box 22 rounds, the Madras 12 Pdr. Hwr. carries on the Limber 34 Rounds, shewing a loss on the part of the 24 Pdr. Hwr. of 12 rounds per Gun.



There would also be the increased expense of 1 Driver and 2 Horses per Gun and per Waggon.

Comparing now the Madras 24 Pdr. How. with the English 12 Pdr. Hwr., we find,

The weights when mounted and equipped as follows :

Madras 24 Pdr. Hwr.			English 12 Pdr. How		
cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
37...	0	... 0	29...	2	... 0

The weights that each Horse would have to draw would therefore be,

Madras 24 Pdr. Hwr.			English 12 Pdr. Hwr.		
cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
4	... 2	... 14	4	... 3	... 18½

Shewing that each Horse in the 24 Pdr. Hwr. Team would have to draw a less weight than each horse in the 12 Pdr. Hwr. Team by exactly,

$$1 \text{ Qr. } 4\frac{1}{2} \text{ lbs.} = 32\frac{1}{2} \text{ lbs.}$$

The Madras 24 Pdr. Hwr. has with it 22 rounds, the English 12 Pdr. Hwr. has on the Limber 36 rounds, shewing a loss on the part of the 24 Pdr. Hwr. of 14 rounds per Gun.

There would also be the increased expense of 1 Driver and 2 Horses per Gun and per Waggon.

It remains now to be shewn whether, the small decrease in the weight to be drawn by each Horse, and the increased effect of fire, which would be obtained by the adoption of the 9 Pdr. and 24 Pdr. Hwr., should counterbalance the loss of many rounds per gun, and the small increased expense of 1 Driver and 2 Horses per Gun and Waggon.

Comparing the Projectiles of the Madras 9 Pdr. with those of the Madras 6 Pdr., and those of the English 6 Pdr. we find.

	Round Shot.	Shrapnel.	Canister.	Total Rounds.
Madras 9 Pdr.	22	6	4	32
Madras 6 Pdr.	36	8	6	50
English 6 Pdr.	27	8 diaphragm.	11	46
Madras 9 Pdr. Round Shot=	198 lbs.	Iron.		
Madras 6 Pdr. Round Shot=	216 lbs.	Iron.		
English 6 Pdr. Round Shot=	164 lbs.	Iron.		
Madras 9 Pdr. Shrapnel=	246	Musket Balls.		
Madras 6 Pdr. Shrapnel=	216	Musket Balls.		
English 6 Pdr. Diaphragm=	240	Carbine Balls.		
Madras 9 Pdr. Canister=	40 lbs.	Iron.		
Madras 6 Pdr. Canister=	37½ lbs.	Iron.		
English 6 Pdr. Canister=	50 lbs.	Iron.		

It is apparent therefore that, if the Madras 9 Pdr. were furnished with the Diaphragm Shell and with a better Canister Shot, the effect of its projectiles would be much greater than that of the superior number of Rounds from either of the 6 Pdrs.

The range and accuracy of fire, as well as the effect of each round, are far greater from the 9 Pdr., (Madras) than from either of the 6 Pdrs.

It follows therefore that the 9 Pdr. is greatly the preferable piece of ordnance.

Comparing the projectiles of the Madras 24 Pdr. Howr. with those of the Madras 12 Pdr. Howr., and those of the English 12 Pdr Howr. we find as follows.

	Common Shell.	Shrapnel.	Canister.	Total Rounds.
Madras 24 Pdr. Howr.	8	10	4	22.
Madras 12 Pdr. Howr.	16	16	2	34.
English 12 Pdr. Howr.	14	18 diaphragm.	4	36.

Madras 24 Pdr. Howr. Shrapnel = 1300 Musket Balls.	}
Madras 12 Pdr. Howr. Shrapnel = 1008 Musket Balls.	
English 12 Pdr. Howr. Diaphragm = 1350 Carbine Balls.	
Madras 24 Pdr. Howr. Canister = 60lbs. Iron.	}
Madras 12 Pdr. Howr. Canister = 18½lbs Iron.	
English 12 Pdr. Howr. Canister = 28lbs. Iron.	

It appears from this that the 24 Pdr. Howr. loses when compared with Madras 12 Pdr. Howr.,

8 Common Shell,

but it gains very greatly in Shrapnel and Canister.

The 24 Pdr. Howr. loses when compared with the English 12 Pdr. Howr., 6 Common Shell and 50 Balls, but gains considerably in Canister.

The range and accuracy of fire, as well as the effect of each round, are far greater from the 24 Pdr. Howr. (Madras) than from either of the 12 Pdr. Howrs.

“Armament for  
Horse Artillery.”

It follows therefore that the 24 Pdr. Howr. is greatly the preferable Piece of Ordnance.

The advantages which would arise from the adoption of the 9 Pdr. and the 24 Pdr. Howr. would be still more apparent if the Diaphragm Shell and a more effective Canister Shot were used.

The *advantages* would be.

1. Greater Range
2. Greater effect of fire
3. Greater accuracy of fire
4. Greater mobility of piece.

The *disadvantages* would be.

1. Slight Increase of Expense.
2. A less number of Rounds per Piece.

## DECISION.

From the above arguments and data I come to the conclusion, that it would be for the benefit of the Service if,  
 the 9 Pdr. of 10 Cwt.  
 and the 24 Pdr. Howr. of 10 Cwt  
 were adopted as the Armament for Horse Artillery.

## NOTE 3.

## ON HORSE ARTILLERY IN ACTION.

Having thus shewn the Pieces I advocate for the Armament of Horse Artillery, I will now venture a few remarks on the employment of Horse Artillery during an engagement.

Horse Artillery should always act on the offensive.

"Horse Artillery  
 in Action." It should manœuvre rapidly, change position very frequently, and remain a very short time in the same position.

It should in fact dart about, and strike hard and home, but be itself very difficult to hit.

I will now suppose an engagement to take place on an open plain, each Force consisting of Artillery, Cavalry, and Infantry.

Some of the Horse Artillery, should open the action with the other Light Troops.

I will now suppose the affair to have arrived at that stage when, the General thinks, a Cavalry attack may be made with advantage.

I may here remark, that no Cavalry attack can be delivered against good Infantry with any chance of success, before they have been shaken by Artillery and Infantry Fire.

There are exceptions to this rule, as for instance.

If the Enemy's Arms are damaged by weather, or much use.

• If their Ammunition is failing, consequent on a previous engagement.

If they are becoming disorganised by retreat, fatigue, or privation.

If they are taken by surprise.

Even under the most favorable circumstances however, Cavalry should always be supported by Horse Artillery.

The order being given for the Cavalry to advance and charge, I will endeavour to follow both Cavalry and Horse Artillery through the events that would probably ensue.

The Cavalry will be divided into.

“Horse Artillery in Action.” “First Line,” “Support,” “and Reserve.”

The Horse Artillery should be divided into two two equal portions, which might be called “First Line” and “Reserve.”

The Guns of the “First Line” should be on both flanks of the “First Line” of Cavalry.

The Guns of the “Reserve” should be on both flanks of the “Reserve” Cavalry.

The Cavalry “Support” will keep 400 yds. from the “First Line,” and the Cavalry “Reserve” will keep 400 yds. from the “Support.”

600 yds. may be taken as the extreme effective range of the fire from a line of Infantry.

When the “First Line” of Cavalry arrives at 600 yds. from the Infantry, it will be high time for the Infantry to form square, as will presently appear.

The First Line of Cavalry will Trot (at 9 Miles an hour) over the first 300 yds. in  $1^m 10^{sec.}$ , it will gallop over the next 250 yds. (at 12 miles an hour) in 45 seconds, and charge the remaining 50 yds. (at 20 miles an hour) in 5 seconds; thus giving a total of 2 minutes to move over the 600 yds. •

The Horse Artillery of the "First Line," on arriving at 600 from the Enemy, should Gallop (at 20 Miles) over 300 yds. in 30 seconds, it should then halt, unlimber, fire one round of Canister, and limber up to retire, in 45 seconds; taking up another position at 600 yds. from the enemy in another 30 seconds.

This may appear extraordinary speed, but may be accomplished on even ground, because Horse Artillery at full interval has free scope for developing the utmost speed of the Horses.

Cavalry dare not move very fast, until close upon the enemy on account of the danger of losing its solidity.

"Horse Artillery  
in Action."

It may be assumed that a Battalion of Infantry will form square, from line, in about one minute.

If the word to form square be given to the Enemy's Infantry when your Cavalry are 600 yds. from them, the Infantry will be in square 1 minute. before the Cavalry are upon them, or when the Cavalry are about 350 yds. distant.

The Horse Artillery will be exposed to Infantry fire for 45 seconds, and in position, and 30 seconds retiring at a gallop, and it will never be nearer than 300 yds. to the Infantry.

It will also be exposed to the fire of a portion of the Infantry during its advance, of 30 seconds.

If the Cavalry charge of the "First Line" is successful, the Horse Artillery should limber up and pursue.

If the "First Line" of Cavalry is driven back by the Infantry fire, the Horse Artillery should again gallop up to

300 yds. of the square, fire one round of Canister, and retire as before. The object of the retiring is, to be as short a time as possible exposed to fire, and also to be ready to cover the retreat of your own Cavalry, in case the enemy's horse pursue your Squadrons when driven back from the squares.

The Cavalry "Support" immediately advances and charges, on the "First Line" being driven back; it will have done well to have halted at 600 yds. from the Enemy, so as to be assisted by the Horse Artillery fire, in the same manner as the "First Line" was.

If the "Support" is successful, the Horse Artillery limber up and pursue; if the "Support" is driven back, the whole of the Horse Artillery should open with Boxer's Diaphragm Shell from 600 yds., thereby covering the retreat of the Cavalry.

"Horse Artillery  
in Action." Your whole line should open an Artillery and Infantry Fire, to prevent the Enemy from following up their success.

I have supposed the Cavalry to have been twice unsuccessful, merely for the sake of continuing the action of the Horse Artillery; but if a Cavalry attack were delivered at the right moment, and with vigour, it ought to carry every thing before it.

I have shewn how short a time the Horse Artillery will be exposed to Infantry fire during a Cavalry attack.

The greater part of the attention and fire of the Infantry will also have been devoted to the Cavalry; and the excitement of action, the dust, smoke &c., will tend to diminish the effect of the Infantry fire.

The Enemy's Artillery will of course have been in full play, but your Horse Artillery will have been very difficult to hit on account of its rapid movements.

It may be supposed then, that the Horse Artillery would not suffer any very heavy loss, if handled in the manner above described.

If Horse Artillery have to act as Light Field Artillery, the Guns I propose would be far better able to do so than the present pieces.

The 9 Pdr. and 24 Pdr. Howr. of 10 Cwt., will make very excellent practice, with round shot, Boxer's Diaphragm shell, and Common shell, up to 1,000 yds; at bodies of Troops.

Horse Artillery should seldom engage Artillery; if obliged to do so now, however, it would probably be silenced; if armed as proposed, it would be able to answer the Enemy's Guns.

"Horse Artillery  
in Action"      • If Skirmishers were to annoy Horse Artillery at 900 yds, the Horse Artillery, by firing a few rounds of Boxer's Diaphragm shell, changing position now and then, and widening the intervals of the pieces, would produce very great effect.

Your own skirmishers would also keep the Enemy at work.

The fire of Horse Artillery, when directed upon Troops should generally consist of Boxer's Diaphragm shell or Canister Shot.

Round Shot will however be very effective against Artillery, or deep masses of Troops.

Common shell also are very formidable against bodies of Troops in position, or to fire buildings.

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## CHAPTER 2.

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### NOTE 4.

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#### ON THE ARMAMENT FOR LIGHT FIELD ARTILLERY.

I have not any hesitation in pronouncing the 9 Pdr. Gun and the 24 Pdr. Howr. to be the best Ordnance for Light



Field Artillery; as these Pieces combine mobility and effect in the most useful proportions for this branch of the Artillery Service.

There is a 9 Pdr. Gun weighing  $13\frac{1}{2}$  Cwt. used by Light Field Artillery, and another 9 Pdr. Gun weighing only 10 Cwt. is also used by Light Field Artillery.

There is a 24 Pdr. Howr. weighing  $12\frac{1}{2}$  Cwt. used by Light Field Artillery, and there is another 24 Pdr. Howr. weighing only 10. cwt. also used by Light Field Artillery.

Would it not therefore be of benefit to the Service to endeavour to determine which are the better pieces for the Armament of Light Field Artillery?

"Armaments for Light Field Artillery" I will now proceed to compare the 9 Pdr of  $13\frac{1}{2}$  cwt. with 9 Pdr of 10 cwt.

9 Pdr. $13\frac{1}{2}$ cwt.	9 Pdr. of 10 cwt.
Cwt.	Cwt. qrs. lbs.
Gun..... $13\cdot5$	10...0... 0
Carriage..... $12\cdot6$	10...3... 16
Limber..... $10\cdot5$	10...0... 0
32 { Ammunition } rounds { Stores } ..... $4\cdot6$	4...2... 8
Total..... $41\cdot2$	35...1... 24

Therefore the 9 Pdr. of  $13\frac{1}{2}$  cwt. when mounted and equipped is 5 cwt...2 qrs... $26\cdot4$  lbs. heavier than the 9 Pdr. of 10 cwt. when also mounted and equipped.

If we attach a Team of 8 Horses to each 9 Pdr., we find that every Horse in the heavy 9 Pdr. Team will have to draw 80·3 lbs., more than each Horse in the Light 9 Pdr. Team.

Comparing the charges and projectiles of the heavy 9 Pdr. with those of the light 9 Pdr. we find as follows.

Heavy 9 Pdr.	Light 9 Pdr.
Number of rounds 32	32
Service charge $2\frac{1}{2}$ lbs.	$2\frac{1}{2}$ lbs.

	Round Shot	Shrapnel	Canister.
Heavy 9 Pdr.	18	6 (Diaphragm)	8
Light 9 Pdr.	22	6	4
The Heavy 9 Pdr. round shot	=	162 lbs of Iron	
The light 9 Pdr. round shot	=	198 lbs of Iron	
The Heavy 9 Pdr. Diaphragm Shells	=	360 Carbine Balls.	
The Light 9 Pdr Shrapnel Shells	=	246 Musket Balls.	
The Heavy 9 Pdr. Canister Shot	=	102 lbs. of Iron.	
The Light 9 Pdr. Canister Shot	=	40 lbs. of Iron.	

From this comparison of the projectiles we find that there is a difference in the proportions of the various projectiles and that the Heavy 9 Pdr. has a somewhat more effective Canister Shot than the Light 9 Pdr.

The Diaphragm Shell could be used from the Light 9 Pdr., and the Heavy Canister shot could also be used from that Piece.

"The Armament for  
Light Field Artillery."

The Heavy 9 Pdr. has  
heavier metal by  $3\frac{1}{2}$  cwt.  
heavier charge by  $\frac{1}{4}$  lb.

At present the Heavy 9 Pdr. is drawn by 8 horses and the Light 9 Pdr. is drawn by 6 Horses.

This gives 100 lbs more for each Horse to draw in the Light 9Pdr. Team than in the Heavy 9 Pdr. Team.

We may therefore sum up the advantages and disadvantages which would arise from the general use of the heavy 9 Pdr. with 8 Horses as follows.

#### ADVANTAGES.

1. Greater effect of fire.
2. Greater accuracy of fire.
3. Greater mobility of Piece.

#### DISADVANTAGES.

1. Slight increase of expense.

## DECISION.

That the present heavy 9 Pdr. Carriage could be slightly lightened and and much improved; and that the heavy 9 Pdr. of 13½ cwt. is the 9 Pdr. best adapted for the Armament of Light Field Artillery.

I will now compare in the same manner the 24 Pdr. Howr of 12½ cwt with the 24 Pdr. Howr. of 10 cwt.

24 Pdr. Howr. 12½ cwt.		24 Pdr. Howr. 10 cwt.	
	Cwt.		Cwt, qrs. lbs.
Howitzer.....	12.5	Howitzer	10 ... 0 ... 0
Carriage.....	14.4	Carriage	12 ... 0 ... 0
Limber.....	10.6	Limber	10 ... 0 ... 0
24 rounds { Ammunition } 5.5		24 rounds { Ammunition } 5	5 ... 0 ... 0
Stores. } 5.5		Stores } 0	0 ... 1 ... 15
Total....43		Total....37 .. 1 ... 15	

Therefore the 24 Pdr. Howr. of 12½ cwt. when mounted and equipped is 5 cwt. 2 qrs. 13 lbs. heavier than the 24 Pdr. Howr. of 10 cwt. when also mounted and equipped.

If we attach a Team of 8 Horses to each 24 Pdr. Howr. we find that each Horse in the Heavy 24 Pdr. Howr. Team will have to draw 79 lbs. more than each Horse in the Light 24 Pdr. Howr. Team.

Comparing the charges and projectiles of the Heavy 24 Pdr. Howr. with those of the Light 24 Pdr. Howr. we find as follows.

Heavy 24 Pdr. Howr.		Light 24 Pdr. Howr.	
Number of rounds	24		22
Service Charge	2½ lbs.		2 lbs
	Common Shell	Shrapnel	Canister.
Heavy 24 Pdr. Howr.....	8	12 (Diaphragm)	4
Light 24 Pdr. Howr.....	8	10	4

The Heavy 24 Pdr. Howr. Diaphragm Shells=1200 Musket Balls.

The Light 24 Pdr. Howr. Shrapnel Shells =1300 Musket Balls.

The Heavy 24 Pdr. Howr. Canister Shot = 50 lbs. of Iron.

The Light 24 Pdr. Howr. Canister Shot = 60 lbs. of Iron.

From this comparison it appears, that the Heavy 24 Pdr. Howr. has 2 more rounds of Shrapnel shell, than the Light 24 Pdr. Howr; but the Shrapnel and Canister of the latter Piece are the heavier.

Boxer's Diaphragm shell, however, is a better projectile than the Shrapnel shell.

Also the same Canister shot could be used from the Heavy 24 Pdr. Howr. as is now used from the Light 24 Pdr. Howr.

The Heavy 24 Pdr. Howr. has

Heavier Metal by  $2\frac{1}{2}$  cwt.

Heavier charge by  $\frac{1}{2}$  lb.

At present the Heavy 24 Pdr. Howr. is drawn by 8 Horses, and the Light 24 Pdr. Howr. is drawn by 6 Horses; this gives 80 lbs. more for each Horse to draw in the Light 24 Pdr. Howr. Team than in the Heavy 24 Pdr. Howr. Team.

We may therefore sum up the advantages and disadvantages which would arise from the general adoption of the Heavy 24 Pdr. with 8 Horses as follows.

#### ADVANTAGES.

1. Greater effect of fire.
2. Greater accuracy of fire.
3. Greater mobility of Piece.
4. 2 Rounds more per Piece.

#### DISADVANTAGES.

1. Slight increase of expense.

#### DECISION.

That the present Heavy 24 Pdr. Howr. Carriage could be slightly lightened and much improved; and that the Heavy

24 Pdr. Howr. of 12½ cwt is the 24 Pdr. Howr. best adapted for the Armament of Light Field Artillery.

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NOTE 5.

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ON LIGHT FIELD ARTILLERY IN ACTION.

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It is well known to be impossible for any one to lay down rules by which all Military movements might be governed; but where rule ends genius begins.

I will now suppose two Forces encountering each other on an open and level plain; and I will endeavour to trace out, briefly, the manner in which the Light Field Artillery should be handled.

Your force will be divided into two portions, which may be termed respectively, "Active Line," and "Reserve Line."

"Light Field Artillery in Action." The Artillery of the Force should be distributed as follows—

*With the "Active Line."*

The Mass of the Light Field Artillery.  
A small proportion of Horse Artillery.

*With the "Reserve Line."*

The mass of the Horse Artillery.  
A small proportion of Light Field Artillery.  
The Heavy Field Artillery

Light Field Artillery should possess such mobility, that a General could concentrate its fire, at will, upon any particular point.

In the Horse Artillery, in the Light Field Artillery, and in the Heavy Field Artillery, the Ammunition Waggon should so conform to the movements of their Guns as to be always able to supply Ammunition, before the Limbers are emptied.

Keeping this object in view, they should take advantage of all available cover.

All light Field Pieces should have a few rounds (shot and Cartridge) in the Axletree Boxes.

Several men at each Gun, should have a small cartouch, so as to be able to carry a few rounds on occasion; these same men should also have a few friction tubes, and a lanyard, as also priming Irons.

Several men at each Piece should have Spikes, there should be none with the Piece itself.

The objects of the latter arrangements are that the fire should not be interrupted if No. 4 were hit; and if the Gunners were temporarily driven from their Guns the Enemy should not find spikes ready for use.

When the two Forces, mentioned at the commencement of this note, approach each other, the Light Field Artillery should send some Pieces in support of the Light Troops who open the Action.

When the Light Troops are fully engaged, the whole of the Light Field Artillery of the "Active Line," should advance at a smart Trot, and come into Action at 1,200 yds. from the main body of the Enemy.

Accurate and effective fire can be carried on from Light Field Artillery up to 1,200 yds., at bodies of Troops.

Beyond this distance, Ammunition will be thrown away.

The Light Troops should now retire, and form a support for the Light Field Artillery, until your main body advances.

This latter should at once deploy, under cover of a heavy cannonade.

The Light Field Artillery should be so planted, that it can concentrate its fire, without offering a large mark to the Enemy; and its object should be to annihilate point after point of the opposite line. It takes the Enemy, when possible, in the direction of his greatest length.

At the commencement of the Action, the Guns should direct a fire of Round shot on the Enemy's Guns, and the Howitzers should fire either Boxer's Diaphragm shell or common shell at their Troops.

• The Light Field Artillery should now slowly approach the Enemy, keeping up a continued fire.

The greater number of Pieces should be on the flanks of the Infantry, but some will be required in the centre of the Line.

Guns should be a few paces in advance of a Line of Infantry, but the rear of the Guns should be clear of Troops.

As your Light Field Artillery approach the Enemy, the whole of the Pieces should be laid on their Troops, and fire Boxer's Diaphragm Shell.

The Enemy's Infantry should receive showers of these shells; for it must be borne in mind, that if you break them, their Artillery must share in the defeat.

"Light Field Artillery in Action." It follows from this, that in defensive positions Artillery should fire on Troops and not on Guns.

If the Enemy's Troops still remain in deep columns, they should be plied with round shot and common shell.

I will now suppose that the Enemy bring superior Artillery against you, and that they at the same time make some manœuvres which lead you to change position.

Your Light Field Artillery, strengthened from the "Reserve Line," has now to keep up a heavy fire, while you send your heavier Pieces in the direction of the new position, and manœuvre towards it with your main body.

The Light Field Artillery take care not to impede your movements, while they gradually conform to your plans.

An active Enemy might choose this moment for a Cavalry attack.

Your Infantry at once throw themselves into square.

The Light Field Artillery should now retire rapidly to the outward flank of the rear square, and between the squares.

Those Guns which form between squares, should be commanded by the fire from the flank face of the foremost square.

As the Enemy's Cavalry advance, the Guns should change from Boxer's Diaphragm Shell to Round Shot, and lastly to Canister; the Howitzers should change from Boxer's Diaphragm shell to Blind Common shell, and then to Canister.

The first change should take place when the Cavalry are at 600 yds. distant, and the second when they arrive within 350 yds.

When the Light Field Artillery commence firing Canister at the Cavalry, the Limbers should retire behind your own Squadrons, which have arrived to your support.

"Light Field Artillery in Action." The rounds in the Axletree Boxes will now be fired; the Gunners should have seized a few rounds from the Limbers, and with these should take refuge under the bayonets of the squares, avoiding the front faces.

Artillery should fire up to the last moment, as the very last round may turn the tide.

The few hostile horsemen who may reach the guns will be unable to injure them under a close Infantry fire; and immediately they turn to retire, shattered as they already are by your Artillery and Infantry, they will be followed by Cannon Shot, and Rifle Balls; for your Gunners are again at their Pieces and the Limbers return to keep up the fire.

Your Cavalry and Horse Artillery now follow up the success, supported by some Light Field Pieces.

On the return of your Cavalry the whole of the Light Field Artillery open a vigorous fire, and enable your Infantry to complete the manœuvre, which was interrupted by the Enemy's attack.



Having changed position, the Infantry fire heavily, supported by the Light Field Artillery, until you have sufficiently shaken the Enemy's line to make a general advance.

The Light Field Artillery should now move rapidly to the front, and pour Canister into the Enemy's wavering line.

Your Infantry charge, and complete the Enemy's defeat.

The retreat of the Enemy's Infantry will probably be covered by all his remaining Guns; the whole of your Light Field Artillery should silence these, and open the way for your Cavalry and Horse Artillery to follow in direct pursuit, or these may turn a flank.

The Horse Artillery shatter any masses of the Enemy which may attempt to rally, and your Cavalry, which has suffered but slightly turn the Enemy's defeat into a route.

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### CHAPTER 3.

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#### NOTE 6.

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#### ON THE ARMAMENT FOR HEAVY FIELD ARTILLERY.

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When you increase the mobility of your Artillery by using light Ordnance you thereby diminish its effect, and when you increase the effect of your Artillery by using heavy Ordnance you thereby diminish its mobility.

These two attributes of Field Artillery, namely,

1. Effect.
2. Mobility.

should be combined in different proportions in the different branches of the Field Artillery.

Horse Artillery should have a very large proportion of mobility without too much diminishing the effect of its fire.

The Light Field Artillery should have great effect combined with considerable mobility.

Heavy Field Artillery should have a very large proportion of effect without too much diminishing its mobility.

I have shewn the Pieces which I advocate for Horse Artillery, and those which I think best for Light Field Artillery.

I will now endeavour to bring forward some reasons and arguments in support of the Ordnance I recommend for the Armaments of Heavy Field Artillery, namely,

the 32 Pdr. Iron Gun of 25 cwt. 6 feet long.

I believe that Heavy Field Artillery has not always met with that appreciation which its services, if well handled, would command, on account of the unnecessary cumbersome-

ness and bad construction of both Guns and Carriages; but now, that the manufacture both of Ordnance, and of Artillery Carriages, has arrived at very great perfection, I can see no reason against having several very effective Batteries of Heavy Field Artillery, which would be able to move with an Army in the Field.

The Ordnance at present used by Heavy Field Batteries are 18 Pdr. Iron Guns, and 32 Pdr. Brass Howitzers.

I will now proceed to compare the 32 Pdr. Iron Gun with the 32 Pdr. Brass Howitzer.

32 Pdr. Iron Gun.	Cwt.	32 Pdr. Brass Howr.	Cwt.
Gun.....	25	Howitzer.....	17-75
Carriage about.....	15-5	Carriage.....	13-75
Limber about.....	11-5	Limber.....	10-10
14 { Ammunition } about..	6	14 { Ammunition } ...	4-5
{ Stores. }		{ Stores. }	
Total... 58		Total... 46-1	

The weights of the Carriage, Limber, Ammunition, and Stores for the Iron 32 Pdr. Gun are given here, at the high-

est figure that I think they would reach, if that Piece were to be mounted and equipped in England.

I have purposely put them down more than I think they would probably weigh, so as to place the comparison on the worst footing for the Gun I advocate.

We find from the above data that the 32 Pdr. Iron Gun when mounted and equipped weighs nearly 12 Cwt heavier than the 32 Pdr. Brass Howr. when also mounted and equipped.

At present the 32 Pdr Brass Howr. is drawn by a Team of 8 Horses, and that is also the number I recommend for the 32 Pdr. Iron Gun.

"Armament of Heavy Field Artillery." Every Horse in the 32 Pdr. Iron Gun Team will have therefore to draw more than every Horse in the 32 Pdr. Howr. Team by exactly 168 lbs.

Comparing the charges and projectiles of the Iron 32 Pdr. Gun with those of the 32 Pdr. Brass Howr. we find as follows.

Iron 32 Pdr. Gun	Brass 32 Pdr. Howitzer.
Service Charge 4 lbs.....	3 lbs.
	● Diaphragm Shell ● Canister.
Iron 32 Pdr. 6 Round Shot.....	6.....2
Brass 32 Pdr. Howr. 6 Common Shell....	6.....2

It may be here remarked that the 32 Pdr. Gun could be used as either a Gun or a Howitzer, therefore some of the Guns in a Battery might be furnished with Round Shot and some with Common Shell.

The Iron 32 Pdr. Gun Canister Shot=66 lbs. of Iron.

The Brass 32 Pdr. Howr. Canister Shot=42.65 lbs of Iron .

The Common and Diaphragm shells are the same in both Pieces.

The 32 Pdr. Gun can fire either Round Shot or Common Shell, and has a more effective Canister shot than the Brass 32 Pdr. Howitzer.

The 32 Pdr. Gun has  
Heavier metal by  $7\frac{1}{2}$  cwt.  
Heavier Charge by 1 lb.

The Iron 32 Pdr. Gun will cost far less than the Brass 32 Pdr. Howr., as Iron is well known to be very much cheaper than Gun Metal.

We may therefore sum up the advantages and disadvantages which would arise from the adoption of the Iron 32 Pdr. Gun in place of the Brass 32 Pdr. Howr. as follows.—

#### ADVANTAGES.

1. Greater Range.
  2. Greater effect of fire.
  3. Greater accuracy of fire.
  4. Great saving of expense.
- "Armament of Heavy Field Artillery."

#### DISADVANTAGE.

1. Slight loss of mobility.

#### DECISION.

The advantages gained are so great and the loss of mobility is so immaterial, that the 32 Pdr. Iron Gun is the Piece best adapted for the Armament of Heavy Field Artillery.

I will now compare the 32 Pdr. Iron Gun of 25 cwt., with the 18 Pdr. Iron Gun.

There are 18 Pdr. Guns of the following weights.

1. 42 cwt.
2. 38 cwt.
3. 22 cwt.
4. 20 cwt.
5. 15 cwt.

Numbers 3, 4, and 5, 18 Pdrs. need not be taken into account, as the weights of these Pieces are so small, and

their Charges and Projectiles so light, that they cannot compare for one moment with the 32 Pdr. Gun of 25 cwt. as Heavy Field Pieces.

There remain numbers 1 and 2, 18 Pdr.

I will first compare No. 2, 18 Pdr with the 32 Pdr of 25 cwt.

32 Pdr. Iron Gun,		18 Pdr. Iron Gun.	
	Cwt.	Cwt.	qrs. lbs.
Gun.....	25	Gun.....	38 ... 0 ... 0
Carriage about.....	15.5	Carriage.....	17 ... 2 ... 0
Limber about.....	11.5	Limber.....	7 ... 1 ... 10
14 { Ammunition } Rounds. { Stores. } about 6		Stores.....	2 ... 1 ... 10.5
	Total... 58		Total... 65 ... 0 ... 20.5

"Armament of Heavy Field Artillery." Therefore the 18 Pdr. of 38 cwt. when mounted and equipped weighs about 7 cwt more than the 32 Pdr. of 25 cwt. when mounted and equipped.

At present the 18 Pdr. is drawn by 12 Horses in the Field, but 10 Horses would be able to draw that piece at the rate at which Heavy Field Artillery are expected to move.

I will therefore proceed with the comparison taking the 18 Pdr. with 10 Horses (instead of 12 as at present) and the 32 Pdr. with 8 Horses.

In this case every horse in the 32 Pdr. Team will have to draw 84 lbs. more than each Horse in the 18 Pdr. Team.

Comparing the Charges and Projectiles, we find,

Iron 32 Pdr. 25 cwt.		Iron 18 Pdr. 38 cwt.	
Service charge 4 lbs.		6 lbs.	
	Round Shot.	Diaphram.	Canister.
Iron 32 Pdr.....	6	6	2
Iron 18 Pdr. None with the Gun.			

It follows therefore that we must compare the Ammunition in the 18 Pdr. Ammunition Waggon, with that in the 32 Pdr. Limber and Waggon both.

This will give as follows,—

	Round Shot.	Canister.	Total.
Iron 32 Pdr.....	36 28 Diaphragm	4	68.
Iron 18 Pdr.....	42 12 Shrapnel	6	60.
The 32 Pdr. Round Shot	= 1152 lbs. of Iron.		
The 18 Pdr. Round Shot	= 756 lbs. of Iron.		
The 32 Pdr. Diaphragm Shell	= 4200 Musket balls.		
The 18 Pdr. Shrapnel Shell	= 1080 Musket balls.		
The 32 Pdr. Canister Shot	= 132 lbs of Iron.		
The 18 Pdr. Canister Shot	= 107·8 lbs of Iron.		

“Armament of Heavy Field Artillery.” This shews that the 32 Pdr. has an immense advantage over the 18 Pdr. in Round Shot, in Diaphragm shell, and in Canister Shot.

The 32 Pdr. has also 8 more rounds than the 18 Pdr.

The 32 Pdr. Ammunition Waggon is drawn by 6 Horses.

The 18 Pdr. Ammunition Waggon is drawn by 6 Horses.

We have then Horses as follows.—

32 Pdr.	18 Pdr.
Gun and 1 Waggon	Gun and 1 Waggon.
14	16.

The 18 Pdr. has.

Heavier Metal by 13 cwt.

Heavier charge by 2 lbs.

But the projectiles of the 32 Pdr. are very much superior to those of the 18 Pdr.; and this is seen more especially in the 32 Pdr. Diaphragm shell, which would always be found most effective in the Field.

This projectile was fired from 32 Pdr. Brass Howitzers with great effect at the battle of the Tchernaya. •

The cost of the 32 Pdr. would be less than that of the 18 Pdr. because of the less weight of metal, smaller charge, and less number of Horses of the former Piece.

We may therefore sum up the advantages and disadvantages which would arise from the adoption of the 32 Pdr. as follows.

#### ADVANTAGES.

1. Greater effect of Fire as a Field Piece.
2. Greater accuracy of Fire at moderate Range.
3. Great saving of Expense.
4. A Limber with 14 rounds.

#### DISADVANTAGES.

- |                                      |                                |
|--------------------------------------|--------------------------------|
| "Armament of Heavy Field Artillery." | 1. Slightest loss of mobility. |
|                                      | 2. Less Range.                 |

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#### DECISION.

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The advantages gained are so great that the 32 Pdr. Gun is the Piece best adapted for the Armament of Heavy Field Artillery.

The comparison of the 32 Pdr. of 25 cwt. with the 18 Pdr. of 42 cwt. need not be proceeded with, as the 32 Pdr. will evidently have all the advantages just now enumerated, and will lose much less in comparative mobility.

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#### NOTE 7.

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#### ON HEAVY FIELD ARTILLERY IN ACTION.

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Heavy Field Artillery should be able to move over ordinary country at the rate at which masses of Infantry travel.

Heavy Field Pieces, when judiciously posted, in a defensive position, increase the strength of such position very considerably. •

If Heavy Field Guns are brought up during an engagement and their fire well concentrated on a decisive point, they will produce very great effect.

Many instances might be quoted from the pages of the Military History of the 17th. and 18th. centuries, shewing the power and advantage of Heavy Field Artillery, even in those days, when the "Material" was very imperfect.

We may also find many examples, of the decisive effect produced by a concentrated fire from Heavy Field Pieces, in Napoleon's Campaigns, and in our Indian Wars.

We have again, very recent proof of the importance of such Ordnance, in the valuable services rendered by two British 18 Pdr. Guns, at the battle of Inkermann; and in the effect produced by a British Battery, of four 32 Pdr. Brass Howrs., at the battle of the Tchernaya.

"Heavy Field Artillery in Action." I will now refer back to "Note 5,"  
"On Light Field Artillery in action."

I will suppose the two Forces engaged to be each provided with Heavy Field Artillery, and I will make a few remarks on the manner in which these should be handled.

The Heavy Field Artillery, being with the "Reserve Line," should not be brought into play at the commencement of the action.

Heavy Field Guns should never be advanced into positions where they would be liable to sudden attack. There should always be a proportionate escort of both Cavalry and Infantry with Heavy Field Guns.

In a general engagement a portion of the Cavalry and Infantry of the "Reserve Line" will serve for this purpose.

Even Horse Artillery, and Light Field Artillery, when detached to such a distance as to become isolated, should be accompanied by Cavalry or Infantry, or both, according to circumstances.



If Heavy Field Guns are isolated, an active Enemy will certainly take them, and if unable to carry them off, much loss may nevertheless ensue in men, Cattle, and injuries to the Pieces.

• When the whole of your Light Field Artillery have been unable to check the Enemy, and a change of position has become necessary, the Heavy Field Artillery should move with all despatch to the new position, and there form a "point d'appui" for your Force.

The Commander of the Heavy Field Artillery should be so informed of projected movements, that he may be able to keep his Pieces in hand, and to prevent distant changes of position during an Engagement.

The Heavy Field Artillery, having posted itself to advantage in the new position, should open a fire of shot and shell upon the Enemy's advancing Troops.

" Heavy Field Artillery in Action." I need not here again notice when each particular projectile would be most effective.

When your Infantry are in square, the Heavy Field Guns should fire as heavily as possible.

The Infantry should be careful to form square in such positions, as to give free scope to the fire of the Heavy Field Artillery; for these latter cannot accommodate themselves to the manœuvres of Infantry.

When your whole line reopens a vigorous fire of Artillery and Infantry, the Heavy Field Artillery will do well to direct their attention to the Enemy's Guns, leaving his Troops to your Light Field Artillery.

Your Heavy Field Artillery should dismount and silence the Enemy's Ordnance by a well directed fire of Round Shot, endeavouring to crush the Enemy's Artillery by weight of metal.

When your line makes a general advance the Heavy Field Artillery should follow at a convenient distance in rear.

The Enemy will probably have withdrawn his heavy guns before his Infantry begin to retire, and if a favorable position offer itself in his line of retreat, that will no doubt be seized by him, and he will there rally round his Heavy Field Artillery.

When you come upon him in this new position, your Heavy Field Artillery should play upon his guns in position, while your lighter Pieces accompanied by Cavalry and Infantry deliver an attack on one of his flanks, if practicable.

If Heavy Field Artillery are attacked by Infantry, they should fire until the Enemy reach the muzzles of the Guns; it will be the part of your Infantry to drive the Enemy back, if they should arrive so near.

The Canister fire of Heavy Field Guns is so formidable, that Heavy Field Artillery with its flanks secure, may be considered able to repel an Infantry attack on an open plain.

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NOTE 8.

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ON ORDNANCE.

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Some are no doubt astonished at any but Rifled Ordnance being discussed in these rifling days.

It is not for me to venture to criticise this or that particular Piece of Ordnance, but I will hazard a few remarks at which I hope no one will be able to take exception.

First it is well to inquire what are the objects which we wish to obtain by Rifling Ordnance?

Is it greater range? greater accuracy of fire? greater effect of fire?

The best way of answering these questions is to examine into the capabilities of the present smooth bore cannon.

The 32 Pdr. Iron Gun, (which I have advocated in a former note as the Piece best suited for Heavy Field Artillery,) will make excellent practice up to 1,600 yards, at bodies of Troops.

This range will seldom be obtained in the Field, from the nature of the Country, and where a greater clear range will be found, as in the Indian plains, accuracy of fire will be hard to obtain, on account of the difficulty of judging the distance, and of even seeing the object fired at with sufficient distinctness for exact aiming.

If we turn towards Heavy Ordnance, for the Service of Garrisons, or for Siege Artillery, or for Naval Service, we find that the long 32 Pdr. Iron Gun, and the 68 Pdr. Iron Gun, will make good practice, at large objects, up to 2,500 yards.

"On Ordnance." The 68 Pdr. Gun, of 95 Cwt. has obtained an extreme range 6500 yards, with a charge of 12lbs., and elevation of 24 degrees, and firing an eccentric hollow shot.

If a gun-boat, armed with 68 Pdr. Guns, were to approach a town, it could undoubtedly throw shot and shell into the place from a distance of 3000 yards, but it would make certain hits by steaming to within 2000 yards, and by slowly moving, it would be very safe from the Enemy's fire. Of course, for battering purposes it will always be necessary to advance close up to the enemy's works.

It appears then that our present ranges are quite long enough for all practical purposes.

The effect of the Fire from our present Ordnance is also quite sufficient.

It has not been found possible to construct any vessels or batteries which should be proof against the 68 Pdr. Gun.

Greater accuracy of Fire is unquestionably attained by Rifling Ordnance, for the very same reasons that Rifled small arms shoot truer than smooth bores.

The question of usefulness appears to me therefore to hinge upon the following points.

The present Ordnance are very simple in their construction, and very strong; their Projectiles also are very simple and wonderfully effective. The expense of the present Cannon is also very small when compared with that of Rifled Pieces.

"On Ordnance." The Rifled Ordnance are very complex, both in the construction of "Pieces" and "Projectiles;" they are far more apt to get out of order than smooth bores, (either from exposure or from firing) they are far more liable to accidents, and far more costly.

By bringing the "Rifled Cannon" into action, along with other Ordnance, wherever an opportunity presents itself, more especially when a heavy, close, and long continued fire is required, the respective pieces will tell their own Tales.

I cannot help coming to the conclusion in my own mind, that, neither "Rifled" nor "Breech loading" Cannon will be found to answer for "General Service," and that their specific advantages as "Special Weapons" have yet to be proved.

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#### CHAPTER 4.

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#### NOTE 9.

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#### ON DRAUGHT.

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There are two kinds of Draught Power namely—

- "On Draught."
1. Animal Power.
  2. Mechanical Power.

Animal Power is represented by the various Animals that can be put in Draught.

Mechanical Power may be represented by the Steam Engine, as this is the Mechanical Power now in most general use.

Both Animal Power and Mechanical Power are limited in effect.

The Limit of Animal Power, is the Force which the animal in Draught can exert, combining his weight with his muscular power in the effort.

The limit of Mechanical Power is, the Force which the construction and strength of the parts of the Machine will permit of being exerted.

An Animal is a beautiful Piece of Machinery; having however the great advantage over an Engine, that he can accommodate the degree of his exertions according to the effort required of him.

“On Draught.” A Quadruped is by Mechanical construction a beast of Draught.

A Biped is by Mechanical construction a beast of burden.

This follows from the fact, that the greatest power of a body in motion is exerted in the direction of its greatest length.

Any one who may not be persuaded of this, need only try which is the easier task, to wheel a barrow with a heavy load keeping the body erect, or to wheel the same barrow leaning the body forward.

The effect of the latter plan is to throw the weight of the body in the direction of your effort.

When the body is bent forwards, the centre of gravity is thrown beyond the perpendicular and the man will have a tendency to fall; if his legs permit him to do this there is an end of the experiment, but if not, the tendency to fall will find vent in the direction of the line of the least resistance namely in the direction of the barrow.

The tendency to fall could not exert itself in the direction of the man, because it would then have to overcome the resistance of the man's muscular exertions together with that of the weight of the barrow; for the man and the barrow are connected by the man's arms.

Animal Draught Power increases as the weight of the Animal increases, also as the length of the Animal increases, and as the height of the centre of gravity of the Animal increases.

Animal Draught Power is limited by the muscular strength of the Animal's leg.

An animal who is weak in the legs is not of much use for draught or for any other purpose, but who has not seen many a horse who was weak in the legs drawing heavy loads (on 4 wheels) along a road.

"On Draught." A horse will also draw easier by leaning forward, or by putting his weight into the effort, although he may be already moving in a manner favorable for draught.

A horse who is strong in the legs will draw a greater weight, for a short distance, with a man on his back, than without such extra weight.

The reason of this is, that the additional weight of the man will be exerted in the direction of draught, as was shewn to be the case with the man's weight in the direction of the barrow.

Exactly the same reasoning will prove, that the longer a horse is, the better is he adapted for draught; because the longer he is the further will his centre of gravity be in front of his hind feet (which are his fulcrum,) and the more will his weight be exerted in the direction of draught.

The greater the height of the Animal's centre of gravity, the greater will be the distance that he can throw his centre

of gravity forward by inclining his body in that direction, and therefore the greater will be his power.

In order to obtain the greatest effect from "On Draught." Animal Draught Power, we must consider the structure of the Animal and therefrom determine the best mode of applying him to his work, or in other words, the manner of harnessing.

The Animals used for Artillery Draught, are the Elephant, the Bullock, the Horse, and the Mule.

NOTE 10.

ON ELEPHANT DRAUGHT.

The Elephant is a very heavy animal, and he possesses also great muscular power in his legs.

The centre of gravity of an Elephant is very high and the length of an Elephant's body is considerable.

It would appear therefore that the Elephant should be an excellent beast of Draught.

The following data are from actual experiment.  
"On Elephant Draught."

1. The Elephant is a most powerful Draught Animal.

Instance.—

Two Elephants have drawn an 18 Pdr. Gun over ordinary country at Secunderabad.

The Madras 18 Pdr. Gun when mouted and equipped weighs 82 Cwt.

2. The Elephant is sufficiently docile to be used for Artillery Draught, he will stand fire when trained, and Elephants in Draught will manœuvre sufficiently well for Heavy Field Artillery.

Instance—

18 Pdr. Guns drawn by Elephants have frequently manœuvred with other Troops at Secunderabad when Blank Ammunition has been fired.

3. Elephants may be employed with economy for Draught and also as beasts of burden where forage is abundant.

Instance—

Abstract of the comparative expense of animals attached to the Assam Light Infantry.

Horses.....	578 Rupees.
Bullocks.....	177 Rupees.
Elephants.....	140 Rupees.

This much being known, I will now proceed to that which is problematical.

It would appear injudicious to trust to Elephant Draught alone where Guns have to be brought under Fire; for the following reasons.

“On Elephant Draught.” 1. An Elephant, if wounded, would probably become totally unmanageable, and might not only run away with his gun, but also do much mischief on his way, or before being disengaged from Draught.

2. The number of Elephants in a Gun being never more than two if one were wounded, that particular Gun would be crippled for a considerable time, if not rendered entirely useless.

It is not impossible to put more than two Elephants in a Gun, but more than the Draught of two Elephants would seldom be necessary.

This leads to the conclusion that Elephants are adapted for Artillery Draught only whilst out of Fire.

As Heavy Guns might be brought to any particular point by means of Elephants when no other draught Animals were equal to the task, and might then be placed in position by Cattle, or by men if cattle were not at hand; it is of great importance that the best mode of applying the Elephant to Draught, or in other words the best manner of harnessing him should be decided upon.



The present system of Draught consists of—  
Shafts, with two Elephants Tandem Fashion.

The Harness for the shaft Elephant consists of a saddle, with Girth, Belly-band, Crupper, Breast-strap and Back-strap attached.

The Traces of the Shaft Elephant are attached to the saddle, and the saddle is also secured to the points of the shafts.

The Harness for the leading Elephant consists, of a large girth, with a Crupper and Breast-strap attached.

The Traces of the leading Elephant are fastened to the girth and to the washers of the Limber.

I believe that some objections may be raised against this system of Draught, on account of the liability of the Elephants becoming much inconvenienced by the pressure of the Breast-Strap on the throat, when the Gun is travelling over uneven ground.

“ On Elephant Draught.” If the leading Elephant descend a small Nullah the pressure of the Breast-Strap falls on his Throat.

If the shaft Elephant follow him he will share the same inconvenience.

If the ground is ascending, the saddle and Girth, of the Shaft and leading Elephants respectively, will receive a pull backwards and downwards, this will be immediately checked by their Breast-straps: the consequence is either a choking effect, or an impeding effect on their movements, according as the slope is small or great.

How can this inconvenience of the present Harness be obviated.

One plan was suggested, of drawing entirely by a Breast Strap.

This failed.

The entire stress fell either on the throat, or impeded the movement of the legs.

Another plan was suggested, of drawing from a strap passed round the forehead.

This failed.

The Elephant quietly raised her Trunk, and by drawing in her neck, threw off the strap.

The great difficulty in adapting an Elephant to harness appears to be the shape of the Animal.

An Elephant has a very short neck, which renders any Breast-Strap liable to choke him.

After a short experience with the Elephant, in Draught, I come to the conclusion that the harness might be altered with advantage to the following.—

#### SHAFT ELEPHANT.

The saddle should be altered to a mere Pad to support the Shafts, and therefore should be divested of the Breast-strap, and of the Wooden Frames, to which are now attached, the Breat-strap, Shafts, Traces, and Crupper.

A Collar with Hames should replace the Breast-strap.

" On Elephant Draught". The Traces should be attached to the Hames.

The Pad should be connected with the upper part of the Collar on either side.

The back-strap should be secured by a staple under the Shafts.

The crupper should be connected with the Pad.

#### LEADING ELEPHANT,

The leading Elephant should have a similar Pad and Collar to those of the Shaft Elephant.

The traces of the leading Elephant should run from the Hames of the Shaft Elephant to those of the leading Elephant.

The Shaft and leading Traces should be similar.

Under this arrangement, a leading Elephant could become a shaft Elephant, or a shaft Elephant be put in the lead, as occasion might require.

I cannot see any insurmountable difficulties in the construction of a Collar for the Elephant.

The collar must be so fitted, and the Traces so adjusted, that the Elephant shall suffer no inconvenience either at the throat or in the movement of the legs.

Comparing the present Harness with that here proposed, we find as follows.—

Present Harness.	Proposed Harness.
SHAFT ELEPHANT.	
Saddle.	Pad.
Girth.	Girth.
Belly-Band.	Belly-Band.
Back-Strap.	Back-Strap.
Crupper.	Crupper.
Breast-Strap.	Collar and Hames.

DRAUGHT.

From the Saddle and Breast-Strap.	From the Collar.
Present Harness.	Proposed Harness.

<sup>a</sup> On Elephant Draught.

LEADING ELEPHANT.

A large Girth.	}	{ Pad.
Crupper.	}	{ Girth.
Breast-Strap.	}	{ Crupper.
		{ Collar and Hames.

DRAUGHT.

From the upper part of the Girth and from the Breast-Strap.	}	{ From the Collar.
--	---	--------------------

The more nearly a pull resembles a push, or the further forward the point of Draught, the greater will be the advantage.

This follows, because the weight of the Animal is at once thrown into the direction of draught.

Any one may see that a Horse draws a load with greater ease from the Collar than from the saddle

In the latter case (which refers to lasso harness) the moment the Horse puts himself to work, the Saddle receives a

pull downwards and backwards, this is checked by his breast strap, which therefore receives a pull upwards and backwards, and it is not until the muscular exertions combined with the weight of the Horse have overcome this resistance, that the load is moved onwards.

A portion of the muscular power of the animal is expended by the line of Draught being up and down; instead of straight, as in the case of Draught from the Collar.

There is exactly the same difference between the present and the proposed Harness, for Elephants, as there is between lasso and Collar Harness, for Horses, with respect to Draught.

As lasso Harness cannot always be had the following simple instance will prove the same point.

Try which is the easier Task.

“ On Elephant Draught” To draw a load by means of two ropes passing over the shoulders.

Or to draw the same load by means of one connected rope passing over the neck and under the Arms. Or which is the same thing.

Try which is easier to draw a load over rock or along the level road.

The body in the first example is the same as the rock in the second, because it forces the line of Draught to maintain an up and down direction.

Summing up, we have therefore advantages of proposed Harness.

1. Less Cost.
2. Less Weight.
3. Greater Simplicity.
4. Similarity of Shaft and lead Harness.
5. Better line of Draught.

SECUNDERABAD. }  
26th January 1860. }

W. B. E. ELLIS, Lieut.,  
Royal Artillery.

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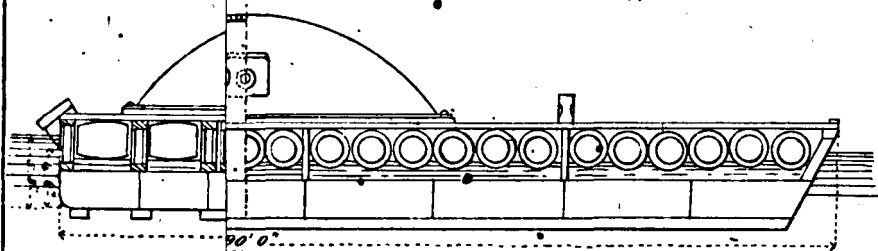
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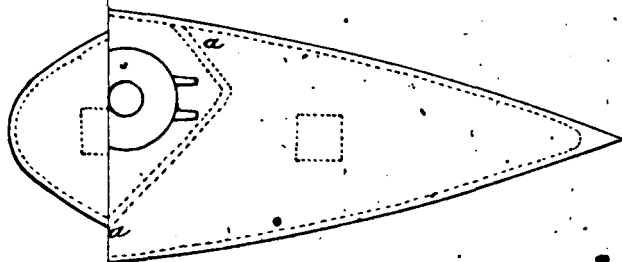


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Shewieud and right astern.—



Shotproof Gun Shields as adapted to Ironcased Ships.

Fig. 2. Two Ports.

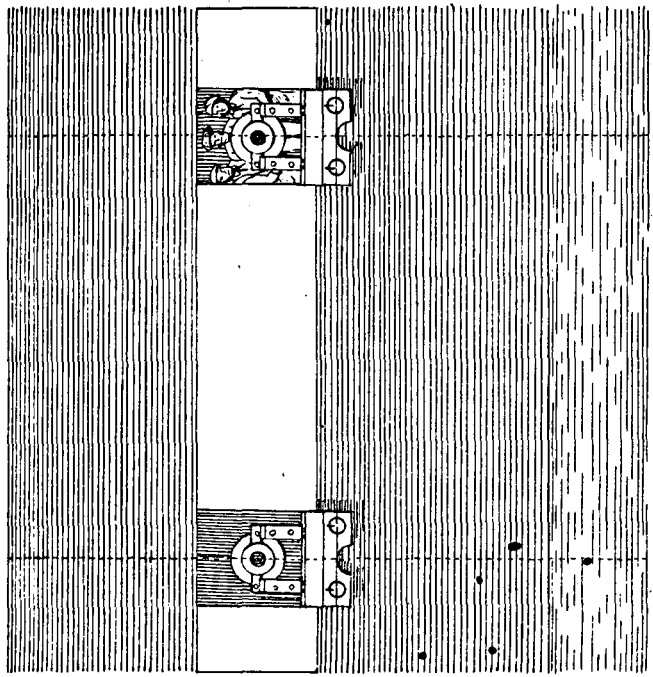
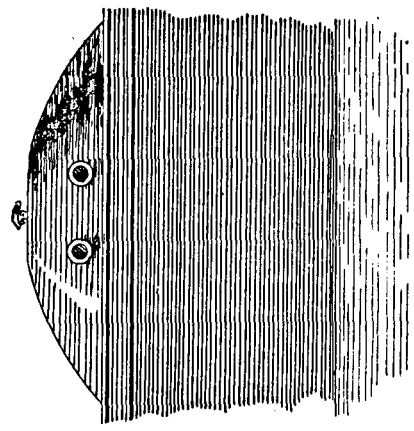
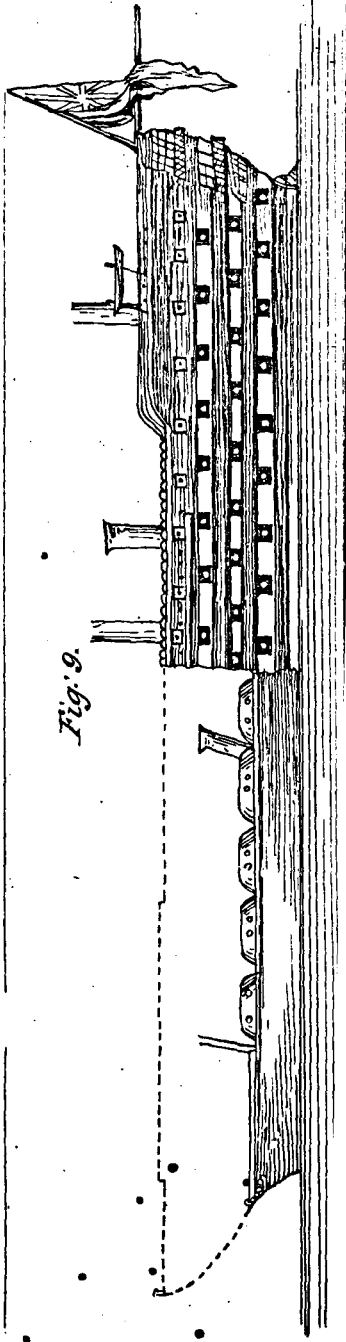
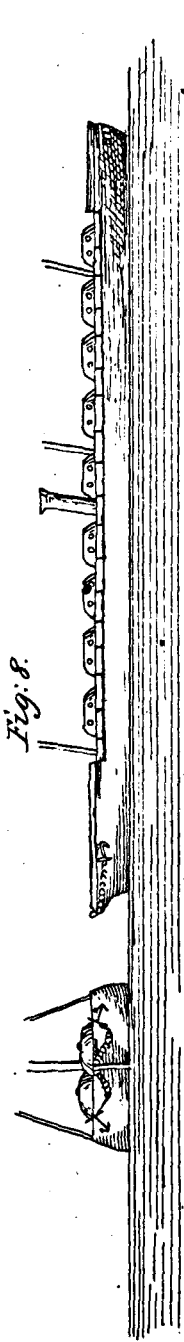
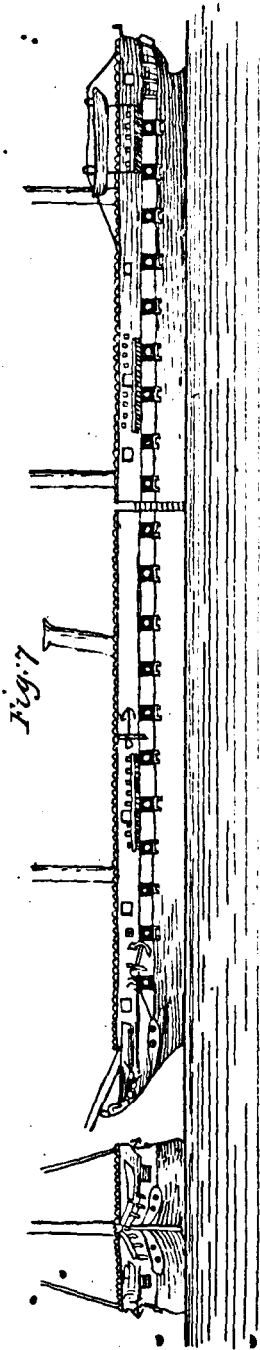


Fig. 3. Shield.





Shot-proof Gun-shields as adapted to Iron-cased Ships.

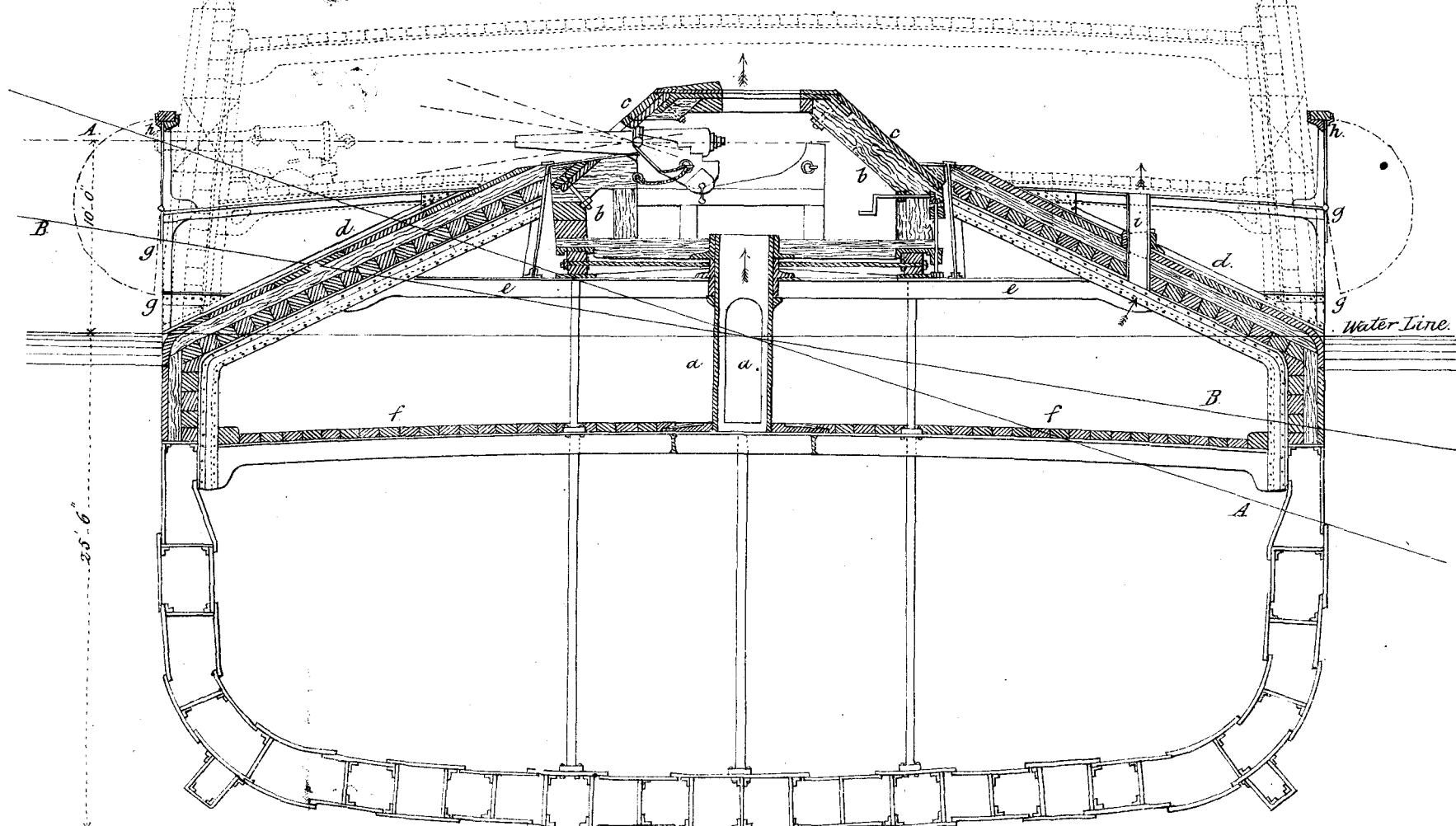


Miscellaneous.

Shot-proof Gun-shields as adapted to Iron-cased Ships.  
 Transverse Section of a Shield Ship on Capt<sup>ry</sup> C.P. Coles R.N. principle.

and also of an Ordinary Iron-cased Ship. —

The upper sides and the Decks of the latter are shewn by dotted Lines;  
 the part below water being common to both. —



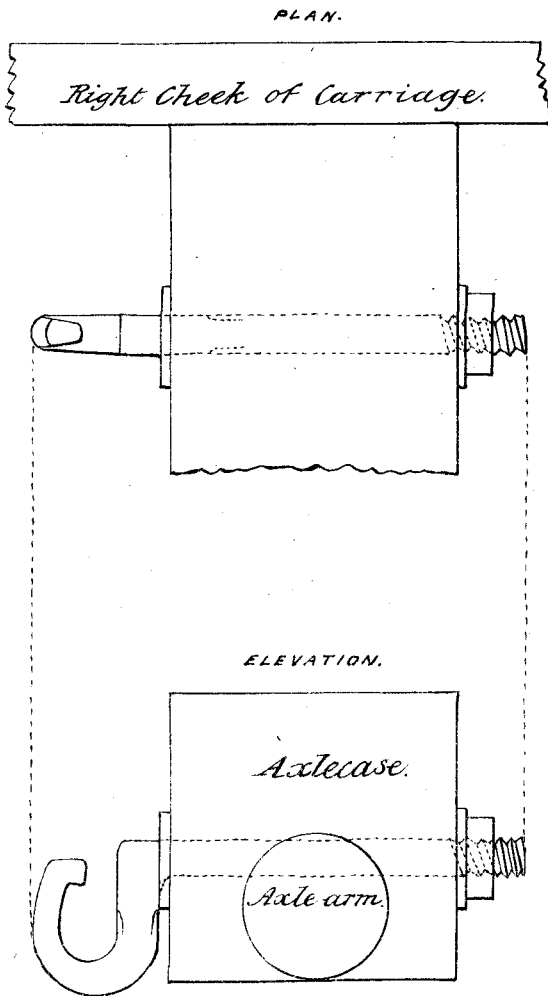
A. Water line, when Ship heels  $19^\circ$  Showing that then the Muzzle of Gun in Shield Ship is  $5' 9''$  above water & that of Broadside Gun in Ordinary Ship is in the water.  
 B.  $D^\circ$   $10^\circ$   $D^\circ$   $80^\circ$   $D^\circ$  is  $5\frac{1}{2}'$  out of the Water.  
 i. Ventilators for lower Deck.



Meeting 208, Article 823.

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Hook for Drag Shoe, fixed in Axle-case.



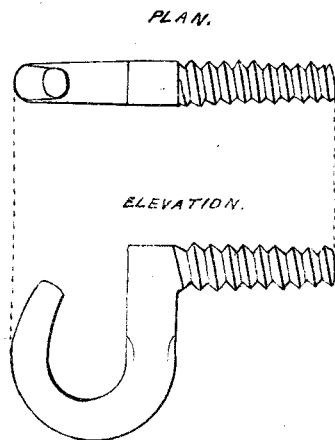
MADRAS ARTILLERY DEPÔT

Meeting 211, Article 832.

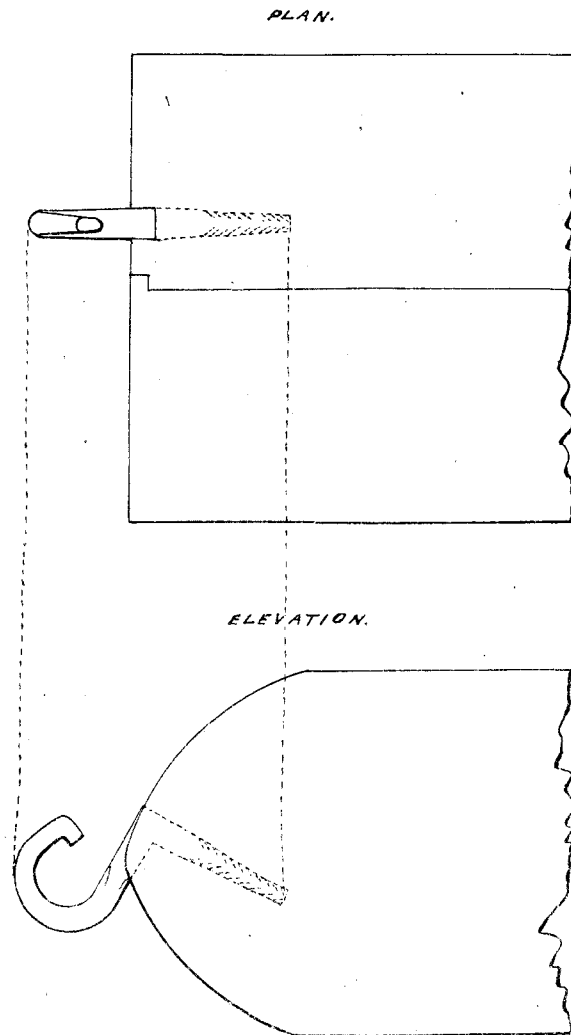
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Hook for Bucket fixed in Breast of Beam.

Page 820.  
Hook for Drag Chain.



Drawn  $\frac{1}{4}$  Size.



J. B.

Meteorological Register, kept at the Artillery Depot in Jany. 1861.

Date.	Barometer.				Farenheit's Thermometer.									Pluvie meter.
	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	Dry Bulb.				Wet Bulb.				From 6 A. M. to 6 A. M.	
					At Sun rise.	8 A. M.	12 Noon.	4 P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.		
														Deg
ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.		
1	29-99	30-03	30-04	29-89	75	78	81	81	71	73	75	74		
2	29-99	30-04	30-05	29-89	75	78	81	80	71	74	75	74		
3	30-09	30-11	30-06	29-90	74	75	83	81	73	73	74	73		
4	30-06	30-09	30-11	30-04	73	74	83	81	71	71	75	74		
5	30-03	30-07	30-08	29-99	73	78	83	82	72	73	76	76		
6	30-01	30-06	30-07	29-99	73	78	84	82	70	74	76	75		
7	29-99	30-04	30-03	29-96	74	78	84	82	71	73	76	76		
8	29-96	30-00	30-03	29-96	73	76	82	81	71	73	76	77		
9	29-98	30-02	30-05	29-98	74	77	83	82	72	74	78	77		
10	30-00	30-03	30-05	29-98	75	78	82	81	73	76	78	77		
11	30-00	30-03	30-07	30-00	77	78	83	82	75	76	79	78		
12	30-02	30-07	30-08	30-00	79	80	84	82	76	77	80	78		
13	30-02	30-08	30-08	30-01	78	81	84	83	75	77	78	78		
14	29-99	30-04	30-07	30-00	79	82	85	84	76	77	79	79		
15	30-04	30-09	30-11	30-04	77	81	84	83	75	77	78	78		
16	30-04	30-09	30-11	30-01	76	77	84	83	74	75	79	78		
17	30-03	30-06	30-05	.....	74	78	85	84	73	76	82	79		
18	Barometer &c. at the Practice Ground.				76	77	84	83	74	75	79	79		
19	.....	.....	.....	30-01	75	78	85	83	74	76	79	79		
20	30-04	30-10	30-04	30-02	73	78	83	81	72	76	78	75		
21	30-01	30-03	30-05	29-96	73	74	87	84	72	73	82	78		
22	30-05	30-08	30-10	30-01	78	80	85	84	75	78	81	81		
23	29-95	29-99	30-02	30-00	76	80	86	84	75	78	80	81		
24	29-98	30-01	30-04	29-96	76	80	87	83	76	78	82	80		
25	30-00	30-03	30-07	29-98	78	81	86	84	76	78	81	80		
26	29-99	30-03	30-05	29-96	78	80	86	84	76	78	81	80		
27	29-97	30-01	30-03	29-95	80	83	85	84	78	79	80	79		
28	29-98	30-00	30-01	29-91	78	79	87	83	75	76	80	78		
29	29-91	29-91	29-99	29-91	74	77	88	86	70	70	77	78		
30	29-92	29-94	29-99	29-91	71	76	86	84	72	74	77	79		
31	29-91	29-93	30-02	29-95	74	77	86	83	72	74	77	79		

Meteorological Register, kept at the Artillery Depot in Feb. 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluvio- meter.
	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	Dry Bulb.				Wet Bulb.				
					At Sun rise.	8 A. M.	12 Noon.	4 P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	29-91	30-01	30-04	29-96	76	79	85	83	73	76	80	79	
2	29-98	30-02	30-05	29-94	78	79	85	84	73	75	78	78	
3	29-94	29-99	30-00	29-92	72	77	85	83	70	73	76	77	
4	29-92	29-96	30-00	29-91	70	74	86	83	70	72	79	78	
5	29-99	30-04	30-06	29-88	73	77	86	85	70	74	79	79	
6	29-98	30-02	29-95	29-90	73	76	88	85	70	74	78	78	
7	29-93	29-99	30-03	29-94	76	77	88	87	71	75	79	78	
8	29-99	30-02	30-05	29-96	76	78	87	85	72	75	80	80	
9	29-98	30-01	30-05	29-95	77	77	86	82	74	75	78	80	
10	29-95	30-00	30-01	29-95	73	77	87	83	71	74	75	77	
11	29-96	30-00	30-05	29-97	75	78	85	83	70	74	77	76	
12	29-96	30-01	30-05	29-97	74	77	84	83	70	73	76	77	
13	29-99	30-02	30-05	29-96	74	77	84	83	71	74	76	77	
14	29-98	30-02	30-07	29-96	77	79	85	83	73	74	78	78	
15	29-98	30-01	30-03	29-93	74	78	84	82	72	74	77	75	
16	29-95	29-98	30-03	29-94	71	75	86	85	70	71	76	76	
17	29-97	29-99	30-03	29-97	68	78	88	83	67	73	75	79	
18	30-01	30-05	30-08	30-00	74	78	84	84	71	75	79	74	
19	30-00	30-02	30-14	30-04	76	80	86	84	73	76	80	79	
20	30-04	30-08	30-10	30-01	76	86	86	82	74	76	80	80	
21	30-02	30-08	30-10	30-01	79	81	86	85	75	77	82	81	
22	30-04	30-08	30-11	30-03	78	82	88	85	75	78	81	81	
23	30-03	30-08	30-09	30-01	78	81	87	84	75	77	81	80	
24	30-03	30-04	30-03	29-98	77	79	84	83	74	75	79	78	
25	29-96	30-00	30-04	29-97	77	79	86	84	74	76	80	79	
26	29-96	29-99	30-02	29-96	72	78	88	86	69	74	80	80	
27	29-99	30-02	30-05	29-97	75	79	87	86	73	76	81	80	
28	29-99	30-03	30-04	29-97	76	81	89	85	74	77	82	79	

Meteorological Register, kept at the Artillery Depot in March 1861.

Dew.	Barometer.				Fahrenheit's Thermometer.								Pluvio- meter.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				
		A. M.	Noon.	P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	30-01	30-06	30-06	29-98	80	84	88	86	80	80	84	83	
2	30-03	30-07	30-08	30-00	79	83	88	86	79	81	83	82	
3	30-03	30-07	30-08	29-92	79	83	88	85	79	81	83	78	
4	29-93	29-97	30-01	29-91	76	80	86	84	72	75	80	76	
5	29-94	29-97	30-00	29-92	76	80	87	85	74	76	81	80	
6	30-06	30-07	30-08	29-99	80	81	90	86	77	78	84	81	
7	29-91	29-95	30-00	29-93	79	82	86	85	77	79	82	80	
8	29-91	29-96	30-00	29-92	80	81	88	85	77	78	83	81	
9	29-94	29-98	30-02	29-93	77	82	88	86	75	78	83	82	
10	29-95	29-99	30-01	29-91	80	83	88	86	78	81	83	82	
11	29-95	30-00	30-00	29-94	81	84	90	87	79	81	84	83	
12	30-00	30-04	30-06	29-96	83	84	85	84	81	82	83	82	
13	29-90	29-94	29-98	29-90	78	78	83	83	77	77	80	78	.05
14	29-96	30-00	30-01	29-94	77	80	82	81	75	78	79	77	
15	29-90	29-93	29-96	29-88	78	81	89	85	76	79	81	82	
16	29-90	29-93	29-96	29-90	79	82	88	86	78	80	85	83	
17	29-90	29-93	29-96	29-92	79	82	88	87	78	80	85	84	
18	29-93	29-97	29-98	29-90	81	84	89	87	80	82	85	85	
19	29-92	29-96	29-96	29-88	83	83	88	86	79	82	83	82	
20	29-88	29-92	29-93	29-85	82	83	82	85	80	81	80	80	
21	29-90	29-92	29-95	29-87	80	80	83	85	78	79	80	79	.9
22	29-90	29-93	29-94	29-86	79	81	89	87	76	77	82	82	.3
23	29-91	29-92	29-93	29-85	81	84	91	87	77	80	86	84	
24	29-92	29-94	29-96	29-88	82	85	91	89	80	82	84	84	
25	29-92	29-94	29-96	29-88	83	85	92	90	80	81	85	84	
26	29-92	30-01	30-01	29-93	83	85	90	89	80	81	86	84	
27	29-94	29-99	30-01	29-92	80	84	92	86	78	81	85	82	
28	29-93	29-97	30-00	29-92	80	83	91	88	78	80	82	81	
29	29-94	29-97	29-99	29-94	80	83	90	87	77	80	82	81	
30	29-98	29-99	29-98	29-93	77	80	86	85	75	77	80	77	
31	29-93	29-93	29-97	29-90	77	81	85	86	75	78	78	81	

Meteorological Register, kept at the Artillery Depot in April 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluviometer.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				From 6 A. M. to 6 A. M.
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
		ins.	ins.	ins.		Deg	Deg	Deg		Deg	Deg	Deg	
1	29.90	29.94	29.95	29.91	78	83	89	86	77	80	80	82	
2	29.91	29.96	29.96	29.90	80	82	89	86	76	80	82	81	
3	29.92	29.95	29.96	29.88	75	80	88	87	74	77	84	85	
4	29.92	29.95	29.94	29.85	79	85	90	88	77	83	86	84	
5	29.92	29.98	29.99	29.89	80	86	90	89	78	83	85	84	
6	29.84	29.88	29.87	29.77	83	86	93	89	81	82	86	84	
7	29.83	29.88	29.86	29.78	83	85	90	88	81	82	83	82	
8	29.81	29.85	29.88	29.79	81	86	91	90	80	81	84	83	
9	29.82	29.86	29.88	29.79	83	88	89	88	81	83	85	84	
10	29.82	29.87	29.89	29.79	84	86	93	88	81	82	84	83	
11	29.83	29.86	29.88	29.80	85	87	90	88	82	84	84	83	
12	29.82	29.97	29.95	29.91	84	86	91	90	81	84	86	84	
13	29.85	29.86	29.96	29.97	83	86	91	90	82	83	87	87	
14	29.78	29.80	29.88	29.85	84	86	90	90	83	84	86	87	
15	29.80	29.84	29.87	29.78	85	87	91	90	83	84	87	87	
16	29.86	29.89	29.90	29.81	84	88	93	89	83	84	88	86	
17	29.86	29.92	29.90	29.80	84	87	91	89	83	84	87	85	
18	29.85	29.91	29.92	29.91	84	86	92	90	82	83	86	84	
19	29.88	29.92	29.93	29.85	84	86	91	89	82	83	85	84	
20	29.88	29.92	29.92	29.84	84	87	92	90	82	84	87	86	
21	29.82	29.94	29.93	29.92	85	87	91	90	83	85	86	85	
22	29.85	29.90	29.88	29.76	85	87	91	93	83	85	87	89	
23	29.79	29.83	29.88	29.83	84	88	92	90	81	84	86	87	
24	29.88	29.90	29.82	29.76	84	86	94	89	83	84	90	86	
25	29.90	29.90	29.91	29.85	86	87	92	90	83	84	86	85	
26	29.90	29.93	29.94	29.85	84	87	92	89	82	84	86	85	
27	29.87	29.92	29.92	29.82	84	87	93	92	81	83	87	86	
28	29.84	29.85	29.80	29.74	85	88	98	93	83	85	87	87	
29	29.84	29.87	29.86	29.74	85	89	100	97	82	83	87	86	
30	29.80	29.82	29.80	29.75	85	88	100	94	82	83	89	88	

Meteorological Register, kept at the Artillery Depot in May 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluvio- meter.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				From 6 A. M. to 6 A. M.
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	29.82	29.86	29.89	29.82	86	88	94	91	85	86	88	88	
2	29.87	29.91	29.92	29.80	85	88	93	90	83	85	89	87	
3	29.82	29.86	29.85	29.78	85	88	97	92	82	85	90	87	
4	29.90	29.84	29.84	29.74	86	89	99	93	82	84	88	89	
5	29.86	29.85	29.83	29.78	86	89	96	94	83	85	89	88	
6	29.80	29.83	29.82	29.84	85	89	101	96	81	84	90	94	
7	29.88	29.89	29.90	29.82	86	89	101	95	84	85	93	94	
8	29.77	29.80	29.80	29.72	88	92	101	98	85	86	87	90	
9	29.75	29.77	29.79	29.72	87	91	101	96	82	84	87	90	
10	29.75	29.78	29.80	29.73	86	90	101	95	84	84	86	90	
11	29.78	29.80	29.83	29.75	87	90	101	94	85	85	88	89	
12	29.75	29.79	29.80	29.72	88	92	102	97	83	85	88	89	
13	29.75	29.77	29.78	29.69	89	93	97	95	84	86	88	89	
14	29.71	29.74	29.74	29.69	86	89	94	90	84	85	89	86	
15	29.73	29.75	29.78	29.69	87	90	92	92	84	85	90	87	
16	29.76	29.80	29.81	29.73	87	89	92	91	83	85	89	86	
17	29.76	29.82	29.81	29.74	86	87	92	90	84	85	89	86	
18	29.78	29.79	29.79	29.71	85	87	93	91	84	85	89	86	
19	29.76	29.78	29.79	29.78	86	87	91	89	83	85	87	85	
20	29.72	29.73	29.74	29.66	84	88	96	93	80	84	87	87	
21	29.71	29.72	29.73	29.65	85	91	99	95	82	85	87	87	
22	29.68	29.72	29.73	29.65	88	90	99	95	81	83	87	87	
23	29.65	29.71	29.72	29.64	88	91	99	96	81	84	89	86	
24	29.67	29.71	29.74	29.65	88	91	99	93	84	84	89	84	
25	29.68	29.73	29.72	29.65	88	90	97	94	88	87	89	87	
26	29.70	29.72	29.73	29.67	88	91	96	94	83	84	89	86	
27	29.70	29.72	29.74	29.70	87	90	98	91	84	85	88	87	
28	29.71	29.75	29.75	29.70	88	89	92	89	85	83	88	86	
29	29.70	29.72	29.75	29.70	85	87	93	87	80	83	82	83	
30	29.71	29.73	29.74	29.67	85	86	91	89	81	82	85	85	
31	29.70	29.73	29.74	29.66	83	87	93	89	80	82	85	86	

Meteorological Register, kept at the Artillery Depot in June 1861.

Date.	Barometer.				Fahrenheit's Thermometer.									Pluvis meter.
	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	Dry Bulb.				Wet Bulb.				From 6 A. M. to 6 A. M.	
					At Sun rise.	8 A. M.	12 Noon.	4 P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.		
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.	
1	29.71	29.73	29.73	29.64	84	88	95	94	81	83	87	90	.	
2	29.73	29.73	29.76	29.70	86	88	91	89	81	83	86	86	.	
3	29.74	29.76	29.77	29.72	85	86	95	97	82	83	87	86	.	
4	29.78	29.80	29.83	29.76	87	89	95	97	84	84	88	89	.	
5	29.81	29.85	29.86	29.76	87	89	95	97	83	84	88	89	.	
6	29.77	29.82	29.83	29.77	87	90	93	99	82	85	89	92	.	
7	29.78	29.82	29.83	29.74	86	91	97	92	79	84	88	87	.	
8	29.77	29.81	29.82	29.74	87	89	96	91	82	81	89	86	.	
9	29.77	29.82	29.84	29.77	86	89	98	93	81	85	90	87	.	
10	29.81	29.82	29.84	29.74	86	89	93	93	83	84	89	87	.	
11	29.79	29.80	29.83	29.76	86	89	95	91	83	84	88	86	.	
12	29.78	29.83	29.84	29.77	86	90	95	96	82	84	88	89	.	
13	29.80	29.83	29.84	29.77	86	91	96	94	81	85	87	89	.	
14	29.76	29.81	29.82	29.76	85	91	97	93	82	85	89	88	.	
15	29.76	29.78	29.76	29.70	86	91	97	92	82	85	90	88	.	
16	29.73	29.76	29.75	29.69	84	87	98	92	81	83	91	88	.	
17	29.73	29.77	29.78	29.71	85	89	95	90	80	83	88	87	.	
18	29.75	29.79	29.81	29.75	86	88	96	92	82	84	88	88	.	
19	29.90	29.81	29.82	29.70	87	90	94	91	84	85	87	87	.	
20	29.79	29.83	29.84	29.76	85	90	92	88	82	85	87	86	.	
21	29.80	29.80	29.81	29.70	86	88	95	92	84	85	89	88	.	
22	29.75	29.77	29.80	29.72	87	89	94	91	84	84	88	88	.	
23	29.75	29.77	29.79	29.77	85	88	92	88	82	84	87	86	.	
24	29.79	29.80	29.82	29.75	83	87	90	90	82	84	87	88	.	
25	29.82	29.84	29.84	29.74	83	86	92	88	82	83	88	86	.	
26	29.77	29.78	29.80	29.72	82	83	91	92	81	81	89	87	6	
27	29.72	29.72	29.75	29.70	82	83	87	88	82	82	84	84	5	
28	29.73	29.75	29.77	29.73	83	84	89	90	81	81	85	86	.	
29	29.70	29.89	29.80	29.76	82	83	90	90	80	82	86	86	.	
30	29.79	29.80	29.81	29.74	84	86	91	92	81	83	86	88	.	

*Meteorological Register, kept at the Artillery Depot in July 1861.*

Date.	Barometer.				Fahrenheit's Thermometer.								Pluvio- meter.
	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	Dry Bulb.				Wet Bulb.				
					At Sun rise.	8 A. M.	12 Noon.	4 P. M.	At Sun rise.	8 A. M.	12 Noon.	4 P. M.	
													Deg
1	29.89	29.90	29.80	29.74	86	88	93	95	84	85	88	90	
2	29.88	29.94	29.83	29.75	87	88	94	96	83	85	89	90	
3	29.79	29.80	29.80	29.73	87	88	95	93	84	85	91	90	
4	29.77	29.80	29.81	29.74	87	89	96	91	85	86	92	90	
5	29.78	29.81	29.83	29.74	86	90	94	92	84	87	90	89	
6	29.77	29.78	29.82	29.73	85	86	93	91	80	84	88	89	.35
7	29.78	29.80	29.81	29.74	83	86	89	88	80	84	86	87	1.6
8	29.74	29.76	29.78	29.72	83	85	89	90	80	81	86	87	.25
9	29.72	29.74	29.76	29.71	81	84	90	91	79	82	86	89	
10	29.72	29.73	29.74	29.70	83	85	89	91	80	81	85	86	
11	29.69	29.70	29.72	29.69	84	86	89	90	82	83	85	86	
12	29.69	29.70	29.72	29.69	83	85	88	88	80	82	85	86	
13	29.70	29.73	29.73	29.63	84	85	89	91	82	83	86	87	
14	29.72	29.75	29.77	29.70	83	83	89	91	81	82	84	87	
15	29.77	29.80	29.83	29.75	81	85	90	92	80	81	82	85	
16	29.77	29.80	29.82	29.74	83	85	88	91	80	81	85	84	.05
17	29.75	29.77	29.78	29.70	84	85	90	93	80	81	82	82	
18	29.74	29.78	29.80	29.72	84	87	93	95	80	81	84	86	
19	29.77	29.80	29.83	29.74	83	85	90	94	79	80	83	92	
20	29.81	29.83	29.85	29.80	84	87	92	94	81	82	86	88	
21	29.79	29.82	29.82	29.80	84	86	95	94	82	84	93	91	
22	29.76	29.77	29.80	29.74	84	86	89	90	81	84	86	87	
23	29.77	29.78	29.80	29.74	85	87	91	95	82	84	87	89	
24	29.81	29.83	29.84	29.77	85	87	93	95	80	79	83	85	
25	29.83	29.84	29.87	29.79	84	84	92	92	80	80	87	87	.05
26	29.83	29.87	29.88	29.80	84	87	94	89	80	82	87	85	
27	29.85	29.86	29.88	29.80	83	82	90	88	80	81	86	85	
28	29.73	29.75	29.76	29.71	84	87	93	91	82	84	86	86	
29	29.83	29.86	29.88	29.89	82	84	91	92	80	81	86	87	
30	29.82	29.84	29.85	29.77	81	86	93	90	79	82	87	86	
31	29.75	29.80	29.80	29.74	85	87	94	89	82	84	86	88	.4



Meteorological Register, kept at the Artillery Depot in August 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluviometer.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	29.75	29.75	29.79	29.73	85	87	91	89	84	85	86	86	
2	29.89	29.80	29.83	29.78	80	79	83	88	79	79	82	85	.4
3	29.89	29.84	29.81	29.75	80	79	84	86	79	79	82	84	.45
4	29.75	29.80	29.81	29.75	81	83	89	86	79	80	86	84	
5	29.79	29.80	29.92	29.74	81	83	90	87	79	81	85	85	
6	29.80	29.81	29.83	29.75	84	85	89	87	83	83	85	85	
7	29.80	29.83	29.83	29.76	82	85	87	87	80	82	85	84	
8	29.77	29.89	29.81	29.75	83	86	92	88	81	83	86	85	.3
9	29.78	29.79	29.80	29.73	82	83	88	88	81	81	85	85	
10	29.80	29.82	29.82	29.78	81	80	82	86	79	79	81	83	.45
11	29.79	29.80	29.81	29.79	81	82	83	85	78	79	80	79	.3
12	29.78	29.85	29.88	29.70	80	81	85	86	78	80	83	83	
13	29.80	29.80	29.82	29.74	81	82	88	89	80	81	85	84	
14	29.76	29.77	29.78	29.72	83	82	87	89	80	80	83	85	
15	29.76	29.77	29.78	29.73	82	82	89	90	79	80	83	84	
16	29.76	29.78	29.80	29.75	82	82	89	90	80	80	84	84	
17	29.77	29.80	29.82	29.74	83	83	90	91	79	80	84	86	
18	29.75	29.90	29.77	29.72	83	84	90	91	79	80	85	85	
19	29.73	29.75	29.75	29.69	83	84	91	93	80	80	86	91	
20	29.74	29.79	29.79	29.73	82	84	93	94	80	82	87	89	
21	29.76	29.82	29.84	29.75	85	86	92	94	81	82	87	88	
22	29.83	29.85	29.88	29.79	83	83	88	93	82	83	85	87	.21
23	29.85	29.88	29.89	29.82	82	85	89	92	81	81	85	86	.25
24	29.92	29.86	29.87	29.78	81	84	88	90	79	81	85	86	
25	29.82	29.86	29.88	29.81	84	84	88	89	84	84	87	87	
26	29.85	29.88	29.87	29.80	82	85	91	90	80	82	88	88	
27	29.84	29.88	29.89	29.89	82	85	88	91	81	82	85	90	
28	29.81	29.85	29.86	29.87	84	86	90	92	82	84	89	90	
29	29.79	29.80	29.83	29.79	81	84	91	90	79	81	85	84	
30	29.80	29.83	29.83	29.76	83	84	89	90	81	82	86	85	.5
31	29.80	29.83	29.84	29.75	83	85	89	91	81	82	86	85	

Meteorological Register, kept at the Artillery Depot in Sept. 1861.

Date	Barometer.				Fahrenheit's Thermometer.								Pluviometer.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	29.76	29.81	29.81	29.73	83	88	92	92	80	83	86	86	
2	29.76	29.79	29.79	29.72	83	86	93	95	80	79	87	88	
3	29.77	29.82	29.83	29.74	84	86	93	95	81	81	85	87	
4	29.80	29.82	29.80	29.73	84	87	92	95	80	81	85	87	
5	29.78	29.81	29.84	29.74	83	87	93	91	79	82	87	86	
6	29.90	29.85	29.85	29.77	83	87	93	89	80	83	91	89	
7	29.81	29.84	29.89	29.77	84	89	95	90	82	83	90	85	
8	29.81	29.85	29.82	29.80	85	87	94	90	80	83	91	86	
9	29.80	29.83	29.83	29.76	83	88	93	91	80	80	85	86	
10	29.80	29.83	29.83	29.76	84	88	95	90	81	84	86	86	
11	29.81	29.85	29.83	29.78	85	88	93	90	83	85	87	86	
12	29.85	29.88	29.88	29.82	84	89	94	90	79	83	86	86	
13	29.85	29.90	29.91	29.80	83	86	89	94	80	82	84	86	
14	29.87	29.88	29.89	29.81	82	84	90	84	81	82	85	82	3
15	29.85	29.87	29.83	29.73	81	86	86	88	80	84	84	86	
16	29.80	29.83	29.84	29.74	81	81	85	87	80	79	83	84	2.1
17	29.80	29.83	29.83	29.76	82	83	89	87	80	81	84	84	
18	29.81	29.86	29.87	29.80	82	85	91	84	79	81	85	81	.1
19	29.85	29.86	29.88	29.78	80	84	89	87	79	80	84	83	.3
20	29.83	29.84	29.85	29.75	79	83	88	87	77	80	84	84	.5
21	29.85	29.86	29.84	29.74	81	82	88	90	80	81	85	85	1.4
22	29.84	29.86	29.83	29.78	82	82	87	87	80	80	84	84	.05
23	29.83	29.85	29.88	29.89	82	83	83	81	81	81	82	80	.3
24	29.83	29.86	29.85	29.78	81	85	85	81	80	82	89	80	.1
25	29.84	29.87	29.85	29.79	81	83	87	87	79	81	83	84	.1
26	29.83	29.86	29.87	29.78	82	82	85	86	80	79	82	83	.05
27	29.85	29.90	29.90	29.84	81	81	86	84	78	80	83	82	
28	29.82	29.85	29.83	29.76	80	83	86	90	79	81	85	85	
29	29.76	29.80	29.89	29.74	81	82	83	88	79	80	86	85	
30	29.77	29.80	29.78	29.73	83	85	90	91	80	81	86	85	

Meteorological Register, kept at the Artillery Depot in October 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluvio- meter.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
		ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg
1	29.78	29.82	29.82	29.73	83	86	91	92	80	82	86	87	
2	29.77	29.83	29.83	29.77	83	85	91	91	80	81	87	88	
3	29.82	29.89	29.87	29.90	85	89	93	95	82	87	89	90	
4	29.85	29.90	29.88	29.80	83	87	93	94	82	84	88	92	
5	29.84	29.85	29.86	29.78	83	88	94	94	82	86	93	94	
6	29.80	29.88	29.86	29.85	83	88	93	93	83	84	82	89	
7	29.84	29.87	29.88	29.84	83	88	92	91	82	84	86	87	
8	29.90	29.94	29.93	29.85	84	87	93	91	83	84	86	87	
9	29.87	29.92	29.90	29.83	84	87	93	91	83	84	85	87	
10	29.88	29.90	29.88	29.83	84	88	92	91	82	83	85	86	
11	29.88	29.94	29.91	29.85	83	88	93	92	81	85	86	90	
12	29.91	29.95	29.95	29.88	83	88	94	90	82	84	86	86	
13	29.92	29.96	29.93	29.88	84	89	97	89	83	85	87	87	
14	29.95	29.97	29.96	29.89	82	85	91	90	81	83	86	86	
15	29.93	29.97	29.94	29.86	84	88	92	89	82	84	86	87	
16	29.89	29.92	29.93	29.87	83	86	94	89	82	85	87	86	
17	29.89	29.92	29.93	29.87	84	86	93	90	81	83	86	87	
18	29.90	29.95	29.95	29.90	83	87	93	91	81	84	86	86	
19	29.93	29.98	29.97	29.90	82	88	92	90	80	85	85	85	
20	29.90	29.93	29.91	29.85	81	82	84	85	81	81	83	83	
21	29.89	29.93	29.93	29.88	83	85	86	85	81	82	83	83	1.2
22	29.98	29.99	29.98	29.92	82	84	87	86	81	82	84	84	
23	29.95	30.00	30.00	29.95	81	84	88	86	80	82	85	84	.3
24	29.95	29.99	29.97	29.91	81	85	87	87	80	83	85	85	
25	29.94	29.96	29.95	29.90	81	84	85	86	80	83	83	84	.5
26	29.95	29.97	29.96	29.90	81	84	87	86	80	83	84	84	.2
27	29.92	29.96	29.92	29.90	81	86	88	87	80	84	85	84	
28	29.91	29.95	29.94	29.90	81	85	89	86	80	82	85	84	
29	29.91	29.96	29.95	29.90	80	84	88	87	79	81	83	83	
30	29.92	29.96	29.95	29.89	79	84	88	87	78	81	83	83	
31	29.92	29.94	29.94	29.89	80	83	88	86	79	81	83	89	

Meteorological Register, kept at the Artillery Dépôt in November 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluviometer.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
	ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	Deg	In.
1	29.93	29.94	29.92	29.85	81	85	89	86	79	82	84	83	
2	29.89	29.90	29.91	29.86	81	82	84	82	79	81	82	81	
3	29.90	29.95	29.90	29.87	80	83	85	83	79	81	83	82	1.3
4	29.88	29.87	29.88	29.82	81	81	82	80	79	80	81	79	1.7
5	29.82	29.84	29.82	29.75	80	81	84	83	79	80	80	81	.75
6	29.70	29.74	29.72	29.66	80	79	75	77	78	78	74	77	1.8
7	29.69	29.71	29.71	29.93	79	78	78	79	79	78	78	79	3.2
8	29.71	29.77	29.73	29.72	77	78	85	84	77	77	83	84	1.9
9	29.80	29.82	29.84	29.80	80	80	86	83	79	79	83	82	.4
10	29.82	29.87	29.85	29.80	80	81	86	84	79	80	84	82	.4
11	29.82	29.87	29.87	29.78	80	81	85	84	79	80	82	81	1.1
12	29.81	29.86	29.85	29.78	81	78	85	85	78	79	82	82	
13	29.83	29.88	29.91	29.83	80	82	86	85	79	80	83	82	
14	29.89	29.90	29.92	29.88	80	81	82	83	79	80	80	80	
15	29.90	29.91	29.95	29.87	79	80	85	84	77	79	78	80	
16	29.91	29.96	29.96	29.88	77	80	83	84	75	77	75	76	
17	29.93	30.01	29.96	29.94	72	83	86	83	71	80	83	79	
18	29.90	30.04	30.05	29.97	73	80	85	84	72	77	79	78	
19	29.96	30.05	30.05	29.97	73	79	84	84	72	77	80	80	
20	29.97	30.02	30.03	29.98	74	79	83	84	73	77	79	79	
21	30.00	30.05	30.05	29.99	76	79	84	83	74	76	79	79	
22	30.02	30.05	30.07	30.03	77	79	84	82	75	76	79	79	
23	30.03	30.06	30.07	30.02	78	80	85	83	77	78	80	79	
24	30.03	30.07	30.08	30.00	78	82	85	83	74	77	80	78	
25	30.04	30.07	30.07	30.01	77	80	84	84	75	76	80	80	
26	30.04	30.09	30.00	30.02	78	80	80	83	75	77	78	80	
27	30.04	30.09	30.1	30.03	78	79	84	83	75	77	79	78	
28	30.04	30.06	30.08	30.00	76	80	84	82	73	76	78	77	
29	30.05	30.06	30.07	30.00	74	78	82	80	71	74	79	75	
30	30.01	30.06	30.06	30.02	74	78	83	81	71	74	77	76	

Meteorological Register, kept at the Artillery Depot in December 1861.

Date.	Barometer.				Fahrenheit's Thermometer.								Pluviometer.
	At Sun rise.	8	12	4	Dry Bulb.				Wet Bulb.				From 6 A. M. to 6 A. M.
		A. M.	Noon.	P. M.	At Sun rise.	8	12	4	At Sun rise.	8	12	4	
		ins.	ins.	ins.	ins.	Deg	Deg	Deg	Deg	Deg	Deg	Deg	
1	30.05	30.09	30.09	30.03	76	79	84	82	74	76	79	80	
2	30.04	30.08	30.09	30.02	78	80	82	82	76	78	78	77	
3	30.02	30.06	30.08	30.00	76	78	80	81	74	75	78	77	
4	30.02	30.06	30.07	30.00	74	77	82	82	72	74	78	77	
5	30.02	30.05	30.05	30.01	74	78	84	83	73	75	81	79	
6	30.02	30.09	30.10	30.02	75	80	86	83	73	79	82	81	
7	30.04	30.08	30.09	30.03	79	81	86	83	77	79	82	80	
8	30.04	30.08	30.06	30.01	77	80	85	83	76	79	81	80	
9	30.01	30.08	30.10	30.04	75	80	84	83	76	78	82	81	
10	30.05	30.08	30.08	30.01	75	79	84	83	75	77	79	80	
11	30.00	30.05	30.03	29.95	74	78	84	82	73	76	81	80	
12	29.96	30.00	29.99	29.93	74	77	84	82	74	76	81	80	
13	29.95	30.00	30.01	29.94	75	79	83	82	75	78	82	81	
14	29.97	30.02	30.04	29.95	74	79	84	83	74	78	82	82	
15	29.98	30.02	30.04	29.95	74	79	86	82	73	77	80	80	
16	29.95	30.00	30.01	29.95	76	80	86	83	74	77	80	79	
17	29.95	30.00	30.00	29.93	75	78	86	84	73	76	80	80	
18	29.94	30.00	30.02	29.97	75	80	86	84	74	77	81	80	
19	29.98	30.02	30.01	29.97	77	78	84	83	75	76	78	78	
20	30.00	30.05	30.04	29.98	76	78	84	84	73	75	79	78	
21	30.01	30.06	30.08	29.92	73	78	84	82	72	75	79	78	
22	30.02	30.07	30.07	29.97	76	80	83	82	73	76	79	79	
23	30.02	30.06	30.07	30.00	75	78	83	82	72	75	78	77	
24	30.01	30.05	30.07	30.00	76	78	84	82	72	75	76	80	
25	30.01	30.08	30.09	30.01	76	78	84	81	73	74	78	77	
26	30.01	30.08	30.10	30.02	76	77	84	81	70	74	78	77	
27	30.04	30.10	30.12	30.05	75	76	78	81	71	74	72	76	
28	30.04	30.08	30.10	30.04	74	76	82	81	71	72	76	75	
29	29.98	30.02	30.06	29.98	73	75	82	81	70	71	76	75	
30	30.02	30.04	30.10	30.00	74	76	82	82	71	73	76	75	
31	30.01	30.04	30.06	30.00	74	76	82	82	72	73	77	77	

Miscellaneous.

Plate 1.

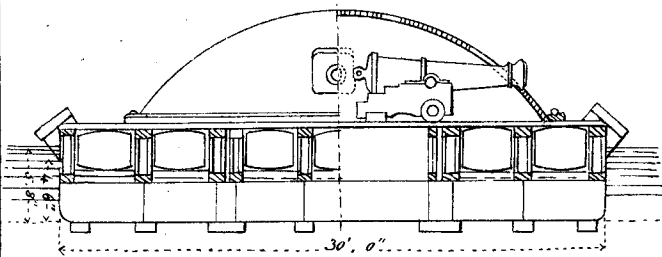
Shot-proof Gun-shields, as adapted to Iron-cased Ships.

Gun or Mortar Cask Raft with Shot-proof Shield.

By Commander C. P. Coles, R. N.

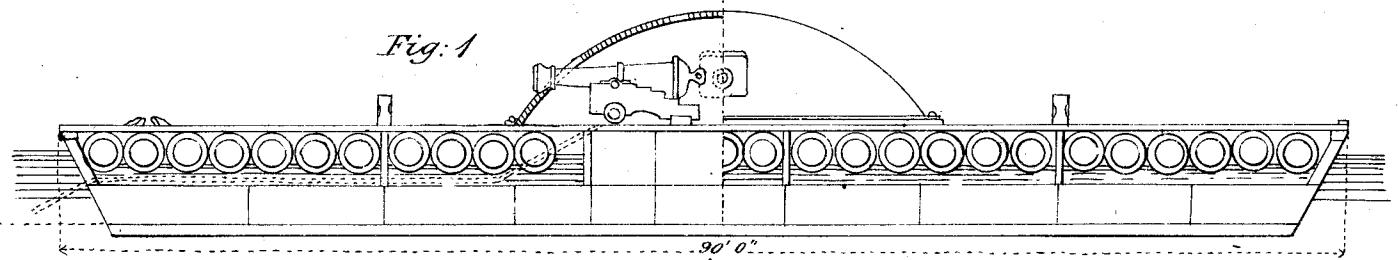
August 1855.

Fig: 1



30' 0"  
Transverse Section.

Fig: 1

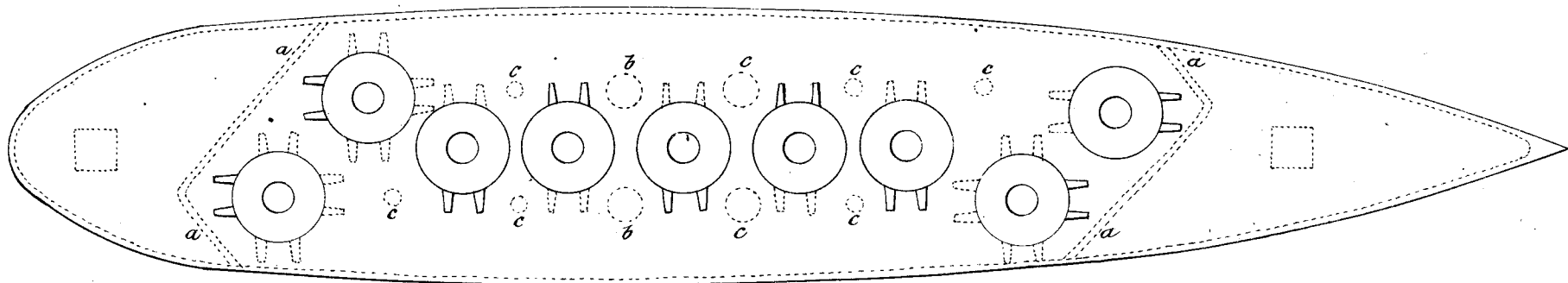


90' 0"  
Longitudinal Section.

Plan of Deck of Shield Ship.

Shewing the Number of Guns that can be brought on either broadside, or right ahead and right astern.

Fig: 6



a. a. a. a. Extremes of Shot-proof portion of Ship.

b. b. Funnel's.

c. c. c. c. Ventilators.