

**General Sir
Henry Drury
Harness, K. C.
B., colonel
commandant ...**

Thomas Bernard
Collinson

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GENERAL
SIR HENRY DRURY HARNESS,
K.C.B.,

Colonel Commandant Royal Engineers.

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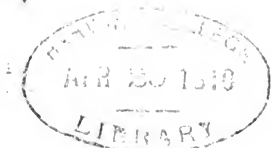
AND EDITED BY

GENERAL WEBBER, C.B., R.E.

“ Rich in saving common sense,
And, as the greatest only are,
In his simplicity sublime.”

LONDON.

1903.



Gift of

Prof. A. C. Coolidge
*This Memoir is published by, and with the approval
of, the Royal Engineers Institute Committee.*

*The following Officers of the Corps have assisted as
members of committee, from time to time convened to
consider the subject:*

*Sir George Leach, Sir Wilbraham Lennox, Sir
E. Thackeray, General Tennant, Sir John McKerlie,
Sir Richard Sankey, Major-General F. H. White,
and Colonel Vetch.*

Note error on page 131.

Captain Fenwick was a First Captain R.E. on the staff of the Army. The Officer who commanded the 21st Company was Captain Glastonbury Neville, who had previously distinguished himself in the Crimea. He was killed on the 30th January, 1858, at the Action of Baroda, near Rhatgur, in Central India. The Officer who commanded the Company to the end of the War was Lieut. J. B. Edwards.

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EDITOR'S PREFACE.

It has fallen to the lot of the member of the Committee nominated by the Corps to deal with the compilation of these Memoirs who joined it last to carry out the work initiated by our dear friend, General Collinson.

The task allows me, to whom he passed it on, to tell the Corps how near to his heart lay the labour of love, of one who, for ability, for modesty, for gentleness and charm of character, has had few compeers amongst so many of our brother officers whom we have known with like natures. His little work, "War Policy for Greater Britain," printed for private circulation shortly before his death in 1901, alone showed the extent of his knowledge and the correctness of his military *coup d'œil*.

To me the task was supremely congenial, as the late Sir Henry Harness had, from my boyhood in the Service, been my *beau idéal* of a really great man, a Christian gentleman, and a true soldier.

I remember when I was a boy officer a remark of the late Sir Colin Campbell (Lord Clyde) in

1859, when with his aide-de-camp (the late Major-General Torrens), Colonel Harness—with me in attendance—joined the early morning walk of the Commander-in-Chief along the road round Jacko at Simla.

Colonel Harness and Major Torrens had gone on in front, and I had the honour of listening to the Chief's narrative of some incident of the Walcheren Expedition, when he turned to me with his sharp Scottish manner—*à propos* of what I do not recollect—with the following words: "I say, boy, what a man that Colonel of yours is. I never met his like outside a book."

Any one who can recall Sir Henry Harness's strength as a debater—his clear exposition (in brilliant calm language) of all that was worth noting in a subject under discussion, his power in an opening or in a winding up speech—will, I am sure, agree with me, that had his lot placed him in public life he would have been a rival of John Bright* in the simplicity and clearness of his language, and would have surpassed Gladstone* manyfold in the extraordinary variety and extent of the information with which his mind was stored on most of the great topics of his time. Fortunately for one of his character, he was never tempted to become a politician.

* My opinion in this respect was formed by frequent visits to the Strangers' Gallery of the House of Commons in the 'sixties.—[Ed.]

Colonel W. D. Marsh, R.E., wrote of him :—

“ His conversation was a continued creation of vivid and forcible features, such as one only realises usually in the thoughtful perusal of great writings. When he instituted the *vivâ voce* examination of a young officer before himself and staff on the completion of the course, I was always attracted by the masterly way in which his observations turned upon principles. He sometimes spoke of the error that would be committed if the Corps was ever sub-divided, with the object of getting greater perfection of detail ; and thus losing sight of the infinite variety of conditions under which the Corps had to serve ; and for which nothing could qualify them except thorough soundness in principles.”

C. E. W.

June, 1903.

INTRODUCTION.

BEING A BRIEF SUMMARY OF THE SERVICES OF
GENERAL SIR HENRY DRURY HARNESS, K.C.B.,
COLONEL COMMANDANT ROYAL ENGINEERS.*

GENERAL HARNESS was the son of John Harness, Esq., M.D., Commissioner of the Transport Board, and was born in 1804, and died on February 10th, 1883, at Oxford.

After passing through the Royal Military Academy at Woolwich, which he quitted in 1824, he was delayed in obtaining the Commission in the Royal Engineers, to which he was entitled, by there being no vacancies at the time in that Corps. To make some good use of this delay, he (in company with other cadets in the same circumstances) went to Mexico, and remained there for a year in the capacity of superintendent of a silver mine.

In 1827 he got his *Commission* as a *second Lieutenant* of the Royal Engineers; in 1832 he became a *first Lieutenant*, in 1843 he became a *second Captain* and in 1847 a *First Captain*; in 1854 he was a Brevet Major, and a Regimental *Lieutenant-Colonel* in 1855, a Brevet *Colonel* in 1858, and a Regimental *Colonel* in 1862. In 1868 he was made a *Major-General*, and in 1877 a *Colonel Commandant*, and in the same year he retired with the honorary rank of General. He

* Extracted by General Collinson, R.E., from the Memoir printed soon after his death.

was made a C.B. for his services in India, and in 1873 promoted to K.C.B.

A comparison of these dates of promotion with the dates of the various services, Military and Civil, to which he was appointed, during that whole period, will show how little the rank he held affected his being selected for important positions.

On leaving the Chatham School he appears to have gone to *Bermuda*, where that kindest and most ingenious of commanders, Colonel Blanshard, was C.R.E., and who was used to describe Harness's life there as one of Arcadian simplicity and love, for he had married soon after he got his commission. Some idea of his capable service there may be obtained from his evidence before the Committee on Barrack Buildings in 1862.

From 1834 to 1838 he was one of the *Instructors in Fortification in the Royal Military Academy at Woolwich*, and in 1844 he returned to that Institution as Professor of Fortification for a short time. During these two periods he reformed the teaching of that subject completely, and left behind him a course of study known as Harness's Papers, which remained the text-book of Fortification for many years. At this time also he assisted Captain (afterwards Sir William) Denison in starting "*The Professional Papers of the Royal Engineers*," after the model of those of the Institution of Civil Engineers, of which Harness became an associate member in 1837.

About the same period he was employed, under the direction of the Irish Railway Commission, in compiling a statement of the internal and external traffic of that country as a guide to the determination of the best routes for the principal lines of railway there. This compilation contained an extraordinary amount of information, collected from a great many sources; and with a map of Ireland, which was made expressly for the purpose by the Ordnance Survey Department, it would be of valuable assistance in the consideration of a system of railway lines in any country where they were

to be introduced for the first time. The compilation was printed among the reports of the Board of Works on that subject.

In 1839 he was offered the situation of Surveyor-General of South Australia, which, however, he declined.

In 1840 Harness was appointed *Instructor in Surveying* at the *Royal Engineer School at Chatham*. He wrote valuable papers for the use of the young officers in this important branch of their professional education, but they have since been superseded by various text-books, compiled by officers of the Corps and published by the War Department. Harness considered that Surveying was one of the most necessary subjects for a young engineer to study.

At Chatham, as at Woolwich, he attracted his pupils, both to himself and to the subject of study, by his simple, winning, manner, and his trustful, patient disposition. He managed to raise an interest even in Practical Astronomy—that least attractive subject to most young men—and all his pupils felt that underneath that gentleness lay such a thorough knowledge of the matter, that the principles at the bottom of it could be made clear to them, and also that the possibility of exact performance could be demonstrated before their eyes.

From 1844 to about 1846 he was employed on the subject of *doing away with the Turnpike system of managing the main roads in Wales*, and substituting for it the county or district management by means of local rating. Unfortunately, he left few papers connected with this matter, and those only formal returns. His discussions on this change, and on the formation of roads and the effect of inclinations on the traffic, would have been useful to young engineers in foreign countries.

About this time the subject of *The Control of the New Railways*, rapidly forming in the kingdom, was exciting the attention of the Board of Trade, and they turned to our Corps as the most available source from which to obtain professional men capable of advising them in the matter. Sir Charles Pasley, R.E., was first appointed to this duty, and in 1846

the work became so extensive that *a separate Commission* was appointed, with Mr. E. Strutt as President, and the Hon. F. Bruce and Captain Harness, R.E., as Secretaries. This was subsequently merged in the Board of Trade, and Harness remained as sole Secretary.

About the same time Harness was employed as arbitrator on the part of the Post Office for the settlement of the amount to be paid to the railway companies for the carriage of the mails.

And when the idea of the first Great Exhibition of 1851 was started, and there was some uneasiness as to its success, Harness was consulted on the matter, and he pointed out the advisability of having some one responsible man to direct the whole affair. There was a difficulty about finding a man possessed of the necessary qualities of organisation, tact, &c. Harness suggested Sir William Reid, who was then Commanding Royal Engineer at Woolwich; and no better selection could have been made.†

Those of our officers who served under Sir W. Reid at the Exhibition of 1851, will recollect the success of his administration. Amid the infinite difficulties, public and private, which frequently threatened the life of that great undertaking, Sir William's quiet good sense and good humour were constantly employed, as he expressed it, "in lubricating the wheels of the coach."

In 1850 Captain Harness was appointed "*Deputy Master of the Royal Mint.*" The special object of his appointment was the reform of the system under which the business of coining money had been carried on ever since its foundation.

"At that time the 'Master of the Mint' was a political officer, whose responsibilities were limited to his Parliamentary duties. Captain Harness, when appointed 'Deputy Master,' therefore became practically the sole responsible head of the Department.

* From a paper by Sir Lintorn Simmons, R.E., in Memoir.

† From a paper by Sir L. Simmons, R.E., in Memoir.

“ Some months after his appointment, the Master of the Mint resigned, and Sir John Herschel (the well-known astronomer) was appointed, but as a permanent officer with no Parliamentary responsibility. Harness considered himself to have been thus superseded, but he loyally continued to work with his new chief until the reforms were completed, and then resigned, though personally solicited by Lord Aberdeen, the Prime Minister of the day, to retain office. Sir John Herschel, when reporting to the Treasury, in February, 1852, the completion of these reforms, thus expressed himself: ‘ I cannot conclude this report without observing that but for the clear views, ready resource, and indefatigable energy of Captain Harness, it would scarcely have been practicable to carry out these reforms in the efficient manner in which it has been done.’ ” *

During the time he was at the Mint he was also employed, by the desire of the Master-General of the Ordnance, in the editing of a *Text-book of Mathematics* for the use of the Royal Military Academy at Woolwich, in which the body of the work was written by some of the masters at the Academy and some by Royal Engineer officers. This was used in the Academy until late years, when the greater age of admission required more advanced works.

In 1853 Captain Harness was appointed a *Member of the Board of Public Works in Ireland*.

The duties of this Board at that time included some large branches of Public Works, such as (1) the arterial drainage of Ireland, in which the navigation of certain water channels was taken into consideration; (2) the abolition of turnpikes, and consequent transfer of the high roads to local authorities; (3) the control and management of certain harbours; (4) the control of the Royal Canal; and (5) the erection and maintenance of public buildings in Ireland.

* From a paper in Memoir by General Sir E. Ward, K.C.M.G., R.E., who established the Royal Mint in Sydney, and who was at the Mint in London with Harness.

In 1855 Lieut.-Colonel Harness was appointed a *Deputy-Inspector-General of Fortifications* at the newly-established War Office in London. That Department was at the same time under reconstruction, which was imperatively demanded by the nation, in consequence of the defects in its organisation which had become apparent during the progress of the Crimean War. Harness was selected by the new Secretary of State for War to take a part in the reorganisation, on account of the high reputation he had gained for his capacity of mind, good judgment, and energy.

He, however, resigned his appointment next year, in consequence of differences of opinion which arose between himself and the then Under-Secretary of State for War upon important questions affecting the office of the Inspector-General of Fortifications.

In 1856 he was appointed to the *Command of the Royal Engineers at Malta*, where he had a very congenial occupation in considering with Sir William Reid, R.E., who was then Governor, the propriety of altering the fortifications of that island to suit the requirements of modern warfare. It was the beginning of the great revolution in Fortification, which was brought about by the marvellous inventions and progress made in the construction of artillery.

In 1857 *The Mutiny of the Indian Troops in India* broke out, and Colonel Harness was offered the command of the body of Royal Engineers which was to form part of the force preparing under Lord Clyde for its suppression. He accepted the command at once, and went direct from Malta, joining a part of the Engineer force he was to command, on its passage through Egypt. He joined the main body under Lord Clyde at Cawnpore, but was almost immediately sent back to Calcutta, in company with the officer commanding the Royal Artillery, owing to some technical difficulties about their position.

But Harness's anxiety to be in the field, and importunity, prevailed. He was recalled to the front, and was present at

the siege and capture of Lucknow, and eventually remained with the Head Quarter Staff until the campaign was over.

In 1860, on his return from the Indian Mutiny, Colonel Harness was appointed *Director of the Royal Engineer School at Chatham*. It was considered that very considerable reforms were required in that School, as in the British Army generally—and he was selected to carry them out. During his management of five years, the foundation was laid of the Sub-marine Mines branch, the Chemical branch, the Pontoon branch as a special organisation in the Corps, and of the Construction branch, as well as the better organisation of the Fortification branch and the Surveying branch.

He resigned the Directorship in 1865, partly on account of failing health, and partly because he felt that he could not, to his own satisfaction, or with efficiency, carry on the duties and work of the establishment, unless he could exercise control over the appointment of instructors, as well as guide the system of instruction and management, which new arrangements at the War Office had to a certain extent taken out of his hands.

The Directorship of the Chatham School was the last appointment he held on the active list of the Corps, but did not end his official career, for he was subsequently employed on various Committees connected with the Military service, and upon others connected with the Civil service.

After his resignation of the post of Director of the Chatham School, he lived for nearly 17 years in a cottage in the village of Worting, near Basingstoke; but from this retirement he was brought out several times to take part in special work. He was a member of the "*Defence Committee*," a body appointed to carry out the recommendations of the Royal Commission on "*The Defences of the Country*" of 1859; Sir Harry Jones, Royal Engineers, being President, and Colonel Jervois (afterwards Sir William), Secretary. This Committee in 1868 merged into a new one, specially appointed to report on the expenditure of the money granted

by Parliament on the recommendation of the Royal Commission. Of this latter Committee Admiral Sir F. Grey was President, and Captain Ardagh (now Sir John), Secretary.

Again, in 1869 he was put on *the Council of Military Education*, and remained a member until that body was abolished, and a Director of Military Education substituted for it. After that Harness was appointed a *visitor of the Royal Military Academy at Woolwich*.

In 1866 the *Cattle Plague* disturbed the whole country, and gave the Privy Council much anxiety and trouble to meet the requirements for its isolation and extinction. Lord Granville, then President of the Council, in conversation with Colonel Harvey, R.E., on this subject, said, that when in his difficulties he remembered that Lord Palmerston used to say in such cases, "Can't you get an officer of Engineers to help you?" upon which he went to the Duke of Cambridge, and, having known Harness before, asked for his services. The Duke readily consented, speaking at the same time highly of Harness; on which Lord Granville said Harness was the very best man of business he ever had to deal with, and that he had known him from time to time for many years, adding that he had always found the Royal Engineers excellent men of business.

So Harness was installed in London as a virtual *Dictator over the Cattle trade of the Country*. He had his inspectors continually on the move, and every day had quite a levee of persons of all ranks interested in the subject: for every day decisions had to be made involving, perhaps, heavy losses on owners of beasts. The late Clerk of the Council, Sir A. Helps, said that during these proceedings the Privy Council heard more truths boldly expressed than they were accustomed to. His vigour then was still so good that he came up from Basingstoke every day, and generally walked the two miles between his house and the station.

In 1868 he was appointed a member of a *Royal Commission on the Water Supply of London*.

The Government of the day in 1866 decided to appoint a Royal Commission to inquire into this question, the object being to ascertain what supply of unpolluted and wholesome water can be obtained by collecting and storing water in the high ground of England and Wales. It was decided that a military Engineer should be associated with the work, and Colonel Harness was nominated. The Commission reported in June, 1869.

In 1876 Harness undertook his last duty, at the instance of Sir Lintorn Simmons, then Inspector-General of Engineers; this was to be *President of a Joint Committee of Artillery and Engineer officers upon Siege operations*. This was one of the most important Committees on the subject of firearms that has been held since the introduction of rifled weapons. For the experiments showed that the ordinary masonry revetments of fortresses could be breached by siege guns of a transportable size at great distances, by inclined fire and from positions covered from the enemy. And "an accurate record of the dispersion of the fire of field guns and rifles was obtained," by practical experiments, and also correct information of the path and power of penetration and other particulars of rifle bullets.

He, however, found his strength unequal to the labour of attending to these experiments, and he resigned before the work was quite completed.

During this latter period of his life he was appointed one of the *Governors of Wellington College*, in the course of which duty, he, and his friend and neighbour, the late Rev. G. R. Gleig (formerly Chaplain-General to the Army), took a joint and active part in discussing the management of that institution.

During this period also he was offered the post of *Governor of Bermuda* and also that of *Guernsey*, both of which he declined. Some years before he had been offered the *Governorship of New Zealand*, which he declined as being a position not in accord with his tone of mind or disposition.

This record of General Harness's services and opinions on

the many subjects, professional and private, which came under his notice, is sufficient to show the character of his mind, but it fails to put before us the influence of his personality.

Note on General Harness's Character.

The two high qualities specially characterising him are only found united in truly great men—a powerful mind and a large heart. But underlying these was a deep religious feeling, which was the source of that single-minded uprightness of purpose pervading all his thoughts. His mind was powerful and comprehensive, and strictly logical. It so happened from the circumstances of his career and from his own inclinations, that it turned chiefly in the direction of mathematical and cognate physical problems; but he was very capable of turning his mind to any of the great questions of the day affecting the human race. He never resorted to mere rules and conventionalities, but went straight to the principle of the matter, in language precise but clear, and with a logical acumen difficult to meet. His papers, therefore, were valuable, not only for the light they threw on the particular question dealt with, but for the fine general principles they usually contained.

It was with him as with all rulers of men, the combination of this strong, clear head, with a strong heart, capable of responding to all the feelings of human kind, which gave him that almost magnetic power over every one he came in contact with personally, and throughout the greatest part of his life there was an activity of his slight frame which gave an animation to the genial expression of his face—it was the abundance of life in a man of many powers. His face was a tower of strength: to look into his clear eyes and read his heart in his thoughtful features, and to feel the quick grasp of his warm hand, gave to the weighty words he uttered a force that carried all doubts and difficulties away with it. You felt with him what true loyalty meant, and what it was to have a chief you believed in, though you might not agree with all his opinions.

This same combination of heart and mind led him to work out all his problems in practical life with careful consideration for the feelings and circumstances of those concerned, and thus all legislation came from him with the impress of sound principles applied with practical sense. He was therefore an excellent administrator, as was shown in several sub-departments of the State which he helped to create or remodel.

And these qualities also made him what he himself wished to be the essential part of his character—a *true soldier*. Not, indeed, a soldier of the parade, or of the office, but in heart and in action—one whose two leading motive powers were boldness of thought and obedience to constituted authority. It was said of him by the head of a great Department, that no man spoke more boldly and persistently against a contemplated measure he thought wrong, and no man carried it out more loyally when decided on.

But, as before mentioned, there was another quality, the source of strength of the other two, and that was his deep-seated faith in the government of the world by a Divine and beneficent Creator. It influenced all his home life, his dealings with all men, his reflections on public matters, and was the source of that spirit of self-sacrifice to what he considered right for the public good which he showed on various occasions.

We have, therefore, here the life of a man of exceptional powers, and of exceptional influence in his generation, and yet who did not rise to a position in the world corresponding to these qualities. This should be a matter of reflection and also of encouragement to young officers of the Corps: for it shows them that at all events in our Corps the outward mark of success is not always required to stamp the performance of good work in their profession. It is also a notable evidence that the true value to the State of a Corps like ours depends, not so much upon numbers, or rank, or organisation, as upon the character and capabilities of each individual member of it.

T.B.C.

CHAPTER I.

MEXICO 1825.—ROYAL MILITARY ACADEMY 1834-44 and 52.

By MAJOR-GENERAL COLLINSON, R.E.

IF the friends of a Woolwich cadet, in these days, after an expensive education at a Public School, and a special one at the Academy, winding up with the right to a commission in the Artillery or Engineers, besides, perhaps, other honours, were told that there were no vacancies in either Corps, what would they say? That contingency, however, was happening in those two Corps about the year 1825: the friends of the young men did not, however, protest in newspapers or Parliament, knowing quite well that it was a time of peace and retrenchment, in which all things pertaining to war were bitter to the taste; but they wisely sought other employment for them until vacancies should occur.

Of the cadets who were so circumstanced, at the beginning of 1825, four determined to try their luck in the silver mines of Mexico, to which English speculators then began to turn their attention: these four were Colquhoun, Wylde, Harness, and Buchan. The three former soon returned to England, and took up their commissions; Colquhoun and Wylde

became distinguished officers in the Royal Artillery, Harness a power and light in the Royal Engineers; Buchan alone remained in Mexico, and showed his capacity in the line he had taken up, by retiring from it about 1856 with a fortune, when the other three were comparatively poor colonels in the army.

The proprietors of the silver mines in Mexico must have been rather hard up for superintendents in those days, for these four young fellows, straight from the Academy and about twenty-one years old, appear to have got situations as superintendents immediately. Harness's post was at a mine called Tlalpuxahua, not far from Mexico city.

There are, unfortunately, very few records of this expedition. Harness was not a letter writer, unless he was called upon to write; few of his letters contained descriptions of the life and people about him. A few letters from Wylde remain, which, however, show the good opinion entertained of Harness by his contemporaries. One from apparently the Secretary of the Council of the Mine, dated a few months after his arrival, shows the high opinion of him the Council had already formed.

July 21st, 1825.

MY DEAR HARNES,

I have very great satisfaction in mentioning that the Council, in consideration of your active exertions in favour of the Company's affairs, have come to the determination of doubling your salary; and you will, therefore, be pleased, after the 1st day of next August, to draw upon the cashier for £300 per annum.

I have further to state that the Council do not think this augmentation of income entails the least obligation upon you more than your original agreement in London; but should you determine on fixing permanently at Tlalpuxahua they feel themselves at liberty, from time to time, still further to increase the sum above specified.

Believe me to be,

Yours most truly,

CHAS. L. BEAUFOY.

H. Harness, Esq.,
etc., etc., etc.

Early in 1826 Harness heard from home that cadets junior to him had received commissions : he promptly determined to return to England ; Wylde had already settled to go.

He apparently did not consider himself bound to give any notice to the Mining Company of his intention to leave ; which is curious in a man who afterwards was so punctilious about fulfilling his duty, and with a Company who had treated him so well : he was probably frightened at, and impelled by, the idea of losing his position in the Corps. His abrupt departure naturally roused the ire of the Company, as they thought they had secured his services for an indefinite time : and they turned upon him with a demand for £75 for breaking his agreement with them. The Company were no doubt justified, technically, in making this demand ; for the original agreement signed by Harness and by the agent of the Company is now before me, and clearly states that he is to serve the Company for three years, and to forfeit £100 if he broke this agreement.

Harness, however, had much to say in his defence ; he pointed out that when he signed the agreement the term of service was not entered, and he was told that in his case it was a mere form, not to be put in force. I think that is a reasonable conclusion to draw, as no young men, expecting any day to get commissions, would have bound themselves to serve any Company for three years. In his case the Company had evidently found out what sort of man they had got hold of, and naturally tried to keep him.

THE ROYAL MILITARY ACADEMY, WOOLWICH.

1834 and 1844.

In 1834 Lieutenant Harness, being then thirty years old, was appointed an Instructor in Fortification in Woolwich Academy. That institution was then still very much in the condition it had been since the termination of the great war in 1815. The idea still was to take boys from fourteen to sixteen years of age and give them a suitable education for

service in the Artillery or the Engineers: this education included *Mathematics*, up to Mechanics; *Fortification*, Permanent and Field, the former according to Vauban, with some modification by Cohorn and others; *Geometrical Drawing*, and the *Representation of Ground*, and *French*, to which was added in 1836 *German*, and *Landscape Drawing*. After passing the examination for commissions there was a six months' practical course of Artillery and of riding.

Entrance was obtained by the nomination of the Master-General of the Ordnance, subject to a qualifying examination. Some idea of the comparatively small number of officers in the two scientific corps at that period may be judged by the fact that in 1836, when the present writer entered, there were only four candidates, and the examination, which was held in the Upper Academy, lasted but one day, and there were not then more than from sixty to eighty cadets at the Academy.

Harness's eager and comprehensive intellect immediately revolted against the formal system of teaching Fortification by rules and elaborate drawings; he at once obtained an alteration in his branch of the subject, basing it more on general principles, and upon consideration of the power of firearms of all kinds at the time. This was the beginning of his reforms, which were gradually expanded, and his papers for a number of years became the text-book of Field Fortification at the Academy, and were known by the more popular title of "Harness's Papers."

These papers were subsequently superseded by the more elaborate text-books on Fortification which have been compiled by officers of the Royal Engineers for the use of Military Schools; and which bring the science of Fortification, both Field and Permanent, up to the requirements rendered necessary by the more powerful guns and small arms subsequently invented.

At that time Captain Denison, R.E. (afterwards Sir William) was employed in the Dockyard at Woolwich as Constructor to the Admiralty. Harness consulted him on his proposed

reforms ; and the following letter to Denison shows that the discussion included the whole subject of the proper education of young men aspiring to be officers of Artillery and Engineers. I think it contains some ideas worthy of consideration even at the present day.

Harness was afterwards Professor of Fortification at the Royal Military Academy for a short time in 1844.

Letter from Lieutenant Harness to Captain Denison, R.E.

4th August, 1836.

MY DEAR DENISON,

. . . In so small an Institution as Woolwich Academy, it is only in peace that you could fix a standard for the final examination. At the outbreak of war a sudden demand for officers for the two Corps would oblige you to abandon it. Unite Sandhurst and Woolwich,* and make an Engineer's commission an honour worth working for and all these difficulties vanish. . . . To return, however, to Woolwich as it is. The age at which boys can generally use their reason well, and thoroughly understand Euclid, appears to me the proper age for admission. To fix it beyond that age would be unfair to the prospects of the boy himself. For the same reason I do not like the idea of examining three candidates for each vacancy. I even think that such a regulation could not be acted on. No parent who had any power of choosing a profession for his son would look to so doubtful a provision,† and an examination of boys at that age, brought from different schools, is no test of their ability. I like much better the year of probation, if strictly acted upon. I do not think either that any rigid classical examination should be made on admission. It would be sufficient to see that that had not been neglected, and that he had been educated, so far, like a gentleman. But I would require for admission a good stock of geographical information, and such a knowledge of French as would enable the cadet to study with perfect facility French military authors, and do away entirely with the necessity of learning it at the Academy ; and instead of the French master, some experienced and

* Sandhurst was then a school for staff officers only.

† The present system (1896) is competitive examination between the ages of sixteen and eighteen, open to everybody, though owing to increasing difficulty in obtaining employment for young men in the upper walks of life there is no lack of candidates.

talented officer should be employed to lecture on the art of war generally.* . . .

As to the education after entrance, we want for our officers men with good reasoning powers, who, having learnt principles, have natural ability to apply them readily and correctly: and the subjects to be studied having been decided upon, care should be taken, by efficient checks, that those subjects are philosophically taught them. The readiest and surest checks to their being taught by rote is to have all the examinations, periodical and final, made by examiners changed annually: perhaps the plan at Oxford is good, four examiners, each appointed for four years, so that one goes out every year. This arrangement would do away with all regulations about "decimals" † in mathematical examinations; and I think an established course of plates in Mechanical Drawing and Fortification might also be abolished, letting the examiners decide from the examinations and from the drawings certified by the masters who were best qualified for commissions; and instead of a public examination, ‡ the questions given by them should be published, together with a report on the general result of the examination.

Mathematics being the test of a person's reasoning faculties, most weight should be given to that science. Fortification also, if well studied, might rank high. To Drawing, like you, I attach but little importance; excellence in Mechanical Drawing is the result of practice and attention. To be able to produce plans, etc., good in proportion to the time passed at the institution, is, I think, all that need be required. If a cadet has attended properly during the time allotted to this, I do not think his want of skill would be a bar to his obtaining a commission early, if his abilities as shown by other studies merit it.

I do not see the necessity for making Descriptive Geometry a part of the course. If they understand their geometry, including the projections of the sphere, taught by the mathematical master of the second Academy, § as

* It seems that Lieutenant Harness considered that the minimum age of admission should be older than it was at that time, viz., fourteen.

† That is, the proportion of marks obtained.

‡ There was then a *viva voce* examination before all the authorities of the institution.

§ There were then four grades or classes, like the forms in a Public School; the first, second, third and fourth Academies, the first being the highest.

a necessary part of Geography, they ought to be able to perform everything which Descriptive Geometry can teach them ; or, at any rate, the addition of a few problems on projections generally, to those on that of the sphere, is all that need be required. . . .

The New Course of Mathematics for the Royal Military Academy, Woolwich.

1847-53.

From the year 1846 to 1855 Captain Harness was employed in various branches of the Civil Departments of the State, and during that time, when he was extremely busy with Railway Commission work, or with the reform of the Mint, he undertook, at the request of the Master-General of the Ordnance, the work of editing a "Course of Mathematics for the Woolwich Academy." Before that time the text-books had been virtually selected by the professor and masters of Mathematics from those in use in schools and colleges. It was considered, that as Mathematics formed so important a branch of the cadet's education, it was desirable to have a special course book, in which those branches of Mathematics particularly applicable to the duties of the Artillery and Engineers should be specially treated. It was also thought desirable, to ensure unity of treatment in those special branches, that there should be one Editor-in-chief. It was a very important and delicate position ; for he had virtually to select the men who were to write the several branches from among the professors and masters at the Academy, each of whom might, no doubt, fairly consider himself qualified to write the whole course. The only exception was the course of Geodesy, which was written by Captain Yolland, R.E., then Executive Officer of the Ordnance Survey.

It is good evidence of his judgment that the writers of the several branches were all men whose capabilities were well known, though the name of perhaps the greatest mathematician among them, and a great friend of Harness himself, Mr. P. Barlow, was not one. It will be seen, however, by Harness's

letter to the Master-General on the completion of the work, that Mr. Barlow had rendered most important assistance. Colonel Dundas, Royal Artillery, at Harness's request, assisted him in considering questions relating to gunnery.

It was not till the year 1852 that the work was completed, during which time, Harness, in his responsible position as Editor-in-chief, had read and discussed all the papers of the contributors. His final report to the Master-General of the Ordnance, on presenting him with the course completed in four volumes, is given below :—

18th October, 1852.

To the Right Honourable
Lieut.-General Lord Raglan, G.C.B.,
Master-General of the Ordnance.

MY LORD,

I have the honour to lay before you the course of Mathematics for the Royal Military Academy, which in compliance with the directions given by the Marquis of Anglesey, while Master-General, has been compiled under my superintendence. It will, I trust, not only meet the present wants of the cadets, but also prove useful for such references and further studies as their professional duties may render necessary, after they receive their commissions. The cordial co-operation of the gentlemen employed upon it, and the care bestowed by each of them on the subjects entrusted to him, induce a confident hope that this will be the case, and that their labours will deserve your Lordship's approval.

The names of these gentlemen are published in the title-page of each volume to which they have contributed ; but the valuable assistance afforded by Mr. Barlow, whose name is not thus recorded, also demands my grateful acknowledgment. The reluctance, caused by a sense of my incompetency to undertake the editorship of a course extending far beyond the limits of my own information, disappeared when he consented to aid me. His great experience in the application of Mathematics to practical purposes ; his long connection with the Royal Academy, as one of the mathematical instructors ; the numerous cases in which his former pupils have sought his assistance, when their duties have compelled them to contend with difficult questions ; and the interest he has evinced in their welfare and reputation, by the kindness with which he has always been ready to give that

assistance, marked him out as the best adviser during the preparation of the work required. To him, in all its stages, it has been submitted, and to him must be attributed whatever merit its general conception and arrangement may possess.

Your obedient servant,

H. D. HARNES,

Captain Royal Engineers.

Two other letters, written when he undertook the Editorship—one from Harness, declining to receive any pecuniary reward for his labours as editor, with the minute of the Master-General in reply to it—mark the character of the man and the estimation in which he was held.

Whitehall, 14th May, 1849.

SIR,

I have to acknowledge the receipt this morning of your letter dated the 4th inst., and must request you to state without delay to the Master-General and Board of Ordnance that the gratification of being useful to my brother officers, if, fortunately, the publication of the proposed work ever should prove of use to them, will be an ample recompense for any service rendered by me, and that I could not allow myself to receive any pecuniary payment for this.

The other points alluded to in your letters shall receive immediate attention from me.

Yours,

H. D. H.

N. BYHAM, Esq.

Copy of a Minute of the Master-General, dated May 18th, 1849.

I am very sensible of the disinterested zeal which has marked the conduct of Captain Harness on the present occasion.

Whilst separated from the duties of the Corps of Royal Engineers by his employment in a laborious civil office, that officer consented to undertake a work of great importance to the Military service of the Ordnance, for which he was eminently qualified, and he now declines the pecuniary remuneration which the Master-General and Board deemed it right to offer to him, desiring no other gratification than that of benefiting the Service of which he is a distinguished member.

I beg that these observations, together with the expression of my warm thanks, be communicated to Captain Harness.

(Signed) A. (Marquis of Anglesey),
May 18th, 1849.

When the age of admission to the Academy was raised, and the candidates had to come prepared for examination in the higher Mathematics, the necessity for this special course ceased.

In 1873, while Harness was a member of the Council of Military Education, he was appointed on a Committee to consider "whether it might not be expedient to admit a certain number of University men to the Scientific Corps."

This mode of obtaining officers for the Artillery and Engineers was tried during the emergencies of the Crimean War in 1855-6.

The report of this Committee, while admitting that some excellent officers were obtained on that occasion for both Corps from the Universities and Public Schools, shows that they nevertheless considered that the disadvantages of admitting candidates to the Scientific Corps, "without a previous training at the Royal Military Academy at Woolwich," out-weighed any benefit derived by the Service from that course, except in times of emergency.

T. B. C

CHAPTER II.

COMPILED BY
MAJOR-GENERAL HUTCHINSON, C.B., R.E.

REPORT OF THE IRISH RAILWAY COMMISSION;
WORK AS ARBITRATOR BETWEEN THE POST OFFICE AND
RAILWAY COMPANIES; AND WORK AS SECRETARY
TO THE RAILWAY COMMISSION OF 1846.

Irish Railway Commission.

THIS Commission (consisting of T. Drummond, Esq., Under-Secretary of State for Ireland; Colonel J. F. Burgoyne, R.E., Peter Barlow, Esq., and Richard Griffith, Esq., with Major H. D. Jones, R.E.,* as Secretary), which was first appointed in 1836, and reappointed in 1837, to inquire into the manner in which Railway Communication could be most advantageously promoted in Ireland, obtained permission to employ the services of Lieutenant Harness (at that time an Instructor of Fortification at the Royal Military Academy, Woolwich) in constructing population and traffic Maps to assist them in their work. The following report by Lieutenant Harness, explanatory of the mode in which these maps were constructed, is of an interesting character, and is now given *in extenso*, omitting such tables as it is not deemed necessary to reproduce :—

* Afterwards Sir Harry Jones, K.C.B.

To Major H. D. Jones, R.E., Secretary to the Railway
Commission.

Woolwich, 23rd December, 1837.

SIR,

In compliance with the desire of the Commissioners, I have the honour to forward a description of the principles on which the population and traffic Maps of Ireland have been constructed; premising that they must be considered as statistical maps alone.

Population Maps.—The first is intended to convey at once to the mind an idea of the manner in which the population is distributed over the country; and for this purpose, the depth of shade applied to each part has to be regulated by the density of that population. The Parliamentary census of 1831 gave the number of the inhabitants; the Ordnance maps, so far as they are published, gave the acreages of each barony; and for those not surveyed, the Commissioners supplied the supposed acres. From these data, the number of inhabitants per square mile in each barony was determined, after deducting the population of the towns intended to be shown on the maps. The relative depth of shade for each barony was expressed by the numbers thus obtained. The towns are represented by dark spots, of which the areas are regulated by the number of the inhabitants.

It was at first proposed to abide throughout by the principle just described, but the Commissioners having expressed a wish that something more detailed than shading, by baronies according to their average population, should be attempted, they marked upon a map such barren tracts of bog and mountain as they knew to contain but few inhabitants; assigning also, from their general acquaintance with the country, what they supposed might be assumed as the population per square mile in such parts. The population of each barony containing a portion of these boggy and mountainous tracts, was therefore considered (after allowing a few inhabitants to the barren parts) to inhabit the remaining portion, and the population per square mile was deduced for that part from the data thus furnished.

In order that definite information respecting the population of the country may also be afforded by the maps, the number of inhabitants per square mile in different parts has been engrossed upon it in figures, and also the population, in 1831, of the different towns.

Traffic Maps—These are intended to exhibit, respectively, the relative number of travellers, and the relative weight of merchandise conveyed in different directions throughout Ireland.

Passenger Maps—These have been constructed almost exclusively from data supplied by the Constabulary. To obtain the requisite information, blank returns were sent to each Constabulary district, which, on being filled in furnished a description of the public conveyances passing each police station, with the average number of their passengers; and from these returns a list of public conveyances throughout Ireland was arranged. Besides the check arising from each conveyance being returned by at least two police stations, it has been further checked by returns obtained from Messrs. Purcell, Browne, and Bianconi, the three largest coach and car proprietors in Ireland. The number of travellers between several places on the lines of road from Dublin, to Cork, and Limerick, has been also ascertained by Enumerators, whose observations have, in a great degree, corroborated the result obtained as above, and at the same time corrected a few errors, caused by the same conveyances having been differently described at different stations. A few such errors may still remain, but it is believed that the numbers given on the maps are tolerably correct averages of the number of passengers conveyed weekly, by public conveyances, between the places to which they refer; and as the number of such passengers may be considered a very fair proportional measure of the whole number of travellers in any direction, the *streams of shade*, of which the breadths have been proportioned to those numbers, may be considered as conveying a faithful picture of the relative amount, in different directions, of this description of traffic. The numbers of passengers conveyed by the boats on the Grand and Royal Canals are correctly given from very valuable returns furnished by the two companies.

For the population, and for the existing *passenger traffic*, it has thus been possible to obtain definite information. With respect, however, to the *merchandise* conveyed between different parts of the country, it has been found absolutely impossible to obtain any precise knowledge. In England the turnpike receipts alone, reduced by a little calculation to a common standard of toll, would afford a fair relative measure of the inland traffic; but in Ireland there are so few, that it may be almost said there are no turnpikes. And after enquiries in every direction, no return of trade was supplied that could be depended upon for accuracy. For the trade of the inland towns such returns were, perhaps, hardly to be expected; of those that have been raised from different sources for the same places some returns double and treble the amount of the same articles returned by others; but for the ports, correct returns of the actual tonnage of exports and imports might at least be expected: yet such it has been found

impossible to obtain ; for since 1825 the intercourse between Great Britain and Ireland has been considered a coasting trade, and no records relating to it are kept.

Merchandise Traffic Maps.—The maps representing the traffic in merchandise cannot, therefore, be supposed to convey any definite idea of quantity ; it gives, however, some idea of the general direction of the trade, and of the extent of the country supplying or supplied by each port ; and it has been attempted to make the breadth of the streams correspond with the relative amount of traffic, so far as a judgment could be formed. The returns employed for determining the inland traffic were obtained from the Constabulary. These returns gave, as nearly as the several constables could ascertain, or according to their judgment, the quantity of corn and meal, of butter, eggs, wool, cattle, etc., sent from the various market towns to the different ports, for sale or exportation. They also stated which port each town was dependent upon for its supplies of heavy articles, such as iron, coal, and timber, together with the mode and cost of communicating with it. In some instances, too, the number of carts supposed to be employed, in a given period, between the port and the town was added. Since, generally speaking, no reliance could be placed upon the actual amounts of any of the articles returned, the direction of the trade was, at first, alone attended to, and a line for each stream of trade so returned was drawn upon a map ; many towns, waiting to send their produce in the same direction, made these thick, and they, in fact, became wide in proportion to the number of towns that fed them. The whole map having been thus traced out, the *streams of traffic* on the Grand and Royal Canals, which were found to bear very nearly the same proportion to each other that their traffic does as exhibited in Porter's Tables, were taken as equivalent to the number of towns shown by those tables to be conveyed by them. This supplied a scale ; those *streams* for which anything like definite information respecting weight had been obtained had their breadths corrected by that scale, and the others were left unaltered.

Returns from the Mining Company of Ireland, and other sources, have furnished the information relative to the weight and value of the produce annually obtained from the mines and quarries as given on the map.

Returns, so far as the records of the Custom Houses could supply them, have been obtained of the exports and imports of each port for the year 1835, together with an account of the tonnage of the shipping cleared and entered in 1825, 1835, and 1836 ; from these data numbers were assumed as

affording a measure of the trade of each port, and these numbers were submitted to the several Collectors for their opinions; thus have been obtained the quantities assigned to them on the map.

These amounts finally determined upon, as fair measures of the trade of each port, must be considered then as supplying scales of comparison for the *streams of traffic*, and it would have been useless to attempt anything more definite than this from the data that could be obtained.

Estimates.—As, however, the exports and imports are not true measures of the whole trade of the ports, and as it is desirable to know what the actual tonnage moved into and out of each may at present amount to, I shall now, in accordance with the wish of the Commissioners, submit a result of the estimate of the same, founded on a consideration of the population of each port, its Excise and Custom House returns; and another of the traffic likely to fall upon the proposed line of railway between Dublin and Cork, with its branch to Kilkenny.

Such estimates must necessarily be vague in their results, but they are not likely to be incorrect to the same extent when applied to Ireland as they would be for other countries. Her inland traffic is almost exclusively confined to the conveyance of articles to and from the ports. She has no great manufacturing inland towns, receiving a variety of materials from different ports, and returning their commodities in complicated *streams* for exportation or consumption; with the exception of the trade occasioned by four collieries, as yet of small importance, the mills and some cotton manufactories in the Northern counties, there does not appear to be any transit worthy of notice, of other than agricultural produce. The inland towns are only important in proportion as they offer good markets for such products; and it is in almost every case to the facilities afforded by navigation that those of note owe their superiority. It may safely be said, then, that the only towns of real importance, in a trading point of view, are the ports; that the traffic of the country is confined almost entirely to forwarding agricultural produce to them, and receiving small supplies of imported articles in return.

Estimate of Inland Traffic to and from the Ports.—By estimating the tonnage entering and departing from the ports, it is attempted to show what the gross tonnage of the several streams of traffic, concentrated at each, may amount to; and the result, though most probably not true as regards the actual trade of any town, must, nevertheless, give numbers expressing pretty fairly their relative commercial

importance, or so far, at least, as a carrying trade is concerned.

The following general principles have been observed in forming this estimate :—

I.—To the tonnage exported has been added the grain supposed to be consumed by breweries and distilleries, the food of the inhabitants, so far as it consists of Irish produce, and allowance for the keep of horses, considered in a certain proportion to the population, and an allowance for building materials, turf, and other articles. From the sum thus obtained has been deducted the amount of any articles of the above description included in the list of imports.

II.—In estimating the grain consumed by brewers and distillers, from the general returns of malt and spirits on which duty was paid in 1836 at the different towns in Ireland, it has been assumed that three-fourths of the malt was consumed in brewing, and that the spirits, where they exceeded the quantity that could be produced by the remainder of the malt, were distilled from corn not previously malted. A ton of grain has been allowed for 120 gallons of spirit, and a barrel of beer has been considered to be produced from every three bushels of malt used by brewers.

III.—From the data furnished by the population returns it has been assumed, in determining the consumption of food, that 1,000 inhabitants comprise 305 males and 318 females between the ages of 12 and 60; 39 aged of both sexes; 184 children between 5 and 12 years of age; and 154 under 5. Supposing, then, the women, the children between 5 and 12, and the aged to consume only three-fifths the quantity consumed by a healthy man, and the children under 5 only one-fifth of the same, it is found that 1,000 persons of general population may be considered equivalent to 661 men; and, supposing 1 in 50 to be sick, and to consume one-half of their usual diet, this is reduced to 655 men.

It was also necessary to divide them into classes as consumers; and perhaps, when it is remembered that the weight consumed is the point required, and not the quantities of particular articles, it will be deemed that a sufficient approximation has been made in assuming that one-tenth are unrestricted in their consumption, six-tenths obliged to limit the use of meat and other articles, and that three-tenths subsist entirely on vegetable food.

The quantity consumed daily by a healthy man, in each class of article of food of Irish production, has then been considered to agree with the following table, the offal and waste of each article being included in the weight given.

Articles.	1st Class.	2nd Class.	3rd Class.	Remarks.
	lbs.	lbs.	lbs.	
Animal Food, exclusive of Fish	1	$\frac{1}{2}$	—	Being 96 lbs. annually per inhabitant.
Corn, Flour, and Meal.....	$1\frac{1}{2}$	$1\frac{1}{2}$	—	
Vegetables and Fruit	1	2	11	
Butter, Eggs, Cheese, Milk	$\frac{1}{2}$	$\frac{1}{4}$	—	
Daily Consumption	$3\frac{3}{4}$	4	11	

Ton annually.

The above makes 6'025 lbs. the average daily consumption of a healthy man, and according to the supposition that 1,000 persons are equal to 655 males, an average of 3'946 lbs. for each inhabitant, or nearly

$\frac{2}{3}$ rds

In England and Wales the number of horses not employed in husbandry is equal to about one-fiftieth of the population; the same proportion has here also been assumed, and their daily consumption allowed for at something more than 25 lbs. per horse, making an addition, per inhabitant, of

$\frac{1}{12}$ th

60,000 tons of stone, sand, bricks, and flags are conveyed annually, on an average, into Dublin by the Grand Canal. Supposing the trade of the Royal Canal to comprise one-half that quantity of the same materials, which is in proportion to their gross traffic, 90,000 tons of this description of materials may be assumed as the yearly demand of a town of 214,000 inhabitants, being for each

$\frac{5}{12}$ ths

From the same data, for places where coal is largely imported, as in Dublin, the turf may be assumed at

$\frac{1}{3}$ rd

Total $1\frac{1}{2}$ tons

The amount of Irish produce, exclusive of articles returned by the Excise, brought into each town for its own use, has therefore been taken at $1\frac{1}{2}$ tons annually per inhabitant, with a fourth allowance for turf where the importation of coal is small. There is no source from which the consumption of turf can be exactly ascertained, but it appears probable that for any town where it is exclusively used about $4\frac{1}{2}$ tons must be required annually for each individual of its population.*

* Wakefield, in his "Political and Statistical Account of Ireland," states that 24 cubic feet of 25 kishes each are required for the consumption of

TOWNS IN IRELAND.

Total.	Total to and from the Town.	Supposed present Population.
Tons.	Tons.	
62,000	780,000	265,000
07,000	364,300	63,000
39,600	400,800	110,000
32,400	264,400 ^a	70,000
80,000	235,800	29,000
13,900	213,100 ^b	36,000
67,500	125,900	10,000
39,900	107,600	17,200
10,200	102,650 ^c	18,000
51,000	104,700	14,600
28,400	83,750	10,500
33,900	87,200	12,000
32,700	71,600 ^d	10,000
3,100	58,200 ^e	10,600
2,100	41,400 ^f	6,000
27,300	44,650	5,300
2,820	16,520	2,400
6,500	27,400 ^g	2,700
1,250	27,850 ^h	4,600
950	31,900 ⁱ	4,300
3,600	29,025 ^k	4,500
2,160	19,560 ^l	3,800
9,600	22,350	7,500
5,500	25,850 ^m	6,200
3,600	17,550	3,100
8,800	27,850	7,200
7,950	15,650	2,700
700	10,650 ⁿ	1,800

every in this town, but the quantity
 erable importation of ale and beer.
 either a brewery or distillery. The
 of turf. ^l Including 8,500 tons of
 g 3,200 tons of turf. ⁿ Including

for the consumption of

IV.—From the information afforded by the Excise and Custom House returns it has been ascertained what quantities of spirit, beer, and various other articles are probably brought to each town by land carriage, and also what portion of each is retained for local consumption.

It has been found more difficult to estimate the trade from each town, and the results must be considered less satisfactory. The quantity of any particular article retained for consumption in Ireland cannot be ascertained from the Custom House returns of exports and imports in 1835; for not only the amounts there given are not to be relied upon, but a very large portion also, both of exports and imports, is undescribed, being stated generally as "other articles." It has been attempted, therefore, to infer, from the proportion which the average weight imported at each place, exclusive of coal, bears to the average importation of the kingdom, and also from the quantities received of particular articles, where the returns relating to them could be trusted, what proportion the population of the district dependent upon each port bears to the port itself; and a corresponding proportion of the imports, exclusive of coal, has been considered to be carried from the town. The coal has been deducted in this consideration, although it forms nearly two-thirds, by weight, of the total imports of Ireland, because it is not an article of general consumption.

To the proportion of imports, assumed as above, has been added the surplus produce of the breweries and distilleries, the surplus coal, after allowing from three-fourths to four-fifths of a ton annually for each person; the quantities remaining of articles supposed to have been received by land carriage, after allowing for the consumption of the towns; and one-fifth of a ton per inhabitant for manure, the last proportion being founded on the data afforded by the returns of traffic on the Grand Canal, before alluded to, as being given in Porter's Tables.

The results of an estimate founded on the foregoing principles is given in the table opposite.

Estimate.

The great difference observable in the proportion between the trade from and that to a town, as, for instance, in comparing Belfast with Limerick, or Tralee with Ross, is sometimes

a cabin for the winter, and allowing 10 more for the remainder, makes 35 kishes per family, which may be supposed to average five persons; thus allowing 7 kishes annually per inhabitant. Now the weight of a cubic foot of peat is stated by Tredgold to vary between 44 and 70 lbs.; it is therefore probable that 12 cwts. is the average weight of a kish, and that 7 kishes are equal to about $4\frac{1}{2}$ tons.

owing to one town using turf for fuel, which causes a large traffic to the town, while the other imports coal largely, causing a traffic from the town, and sometimes to a great disproportion in the tonnage of its exports and imports.

No allowance has been made for commodities conveyed through a town, or for articles twice moved, as with flax brought to Belfast to be spun and then returned to the country dealer. But the items considered in forming the estimates, being the great branches of traffic, it is not supposed that the above would cause any important difference in the numbers by which such traffic is expressed.

The allowance for building materials is necessarily vague ; it is probably low for Dublin, a paved and well-built city, yet high for other inferior towns. It would vary with the rate of increase in the population of the town, and if a more exact estimate on this point were at any time required, it is probable that by considering the rate of that increase, the nature of the houses and the condition of the streets, in each case, a tolerably correct result might be obtained.

*Estimate of Traffic on the Proposed Railway from Dublin to
Cork.*

With respect to the traffic likely to be carried on upon the proposed line of railway between Dublin and Cork, it has been attempted, in the absence of real information respecting the trade of the country in its vicinity, to arrive at the conclusion by tracing out the district likely to employ it, and then estimating the production and consumption of different portions of that district, from general averages, in the following manner, the desire throughout having been to obtain a result below, rather than above, the truth :—

If from a port a line of railway or a canal be carried into a country, the whole of the surplus produce of which could find a market at that port, and there were no competing facilities for communication on the right and left of such line, or natural barriers impeding merchandise being brought to it, it may fairly be assumed that it would receive the traffic of the country to the right and left, from distances increasing as the distance from the port increased, but depending on the relative expense of the ordinary land carriage and that by such railway or canal ; the limit being the distance at which the land carriage to the line, together with the conveyance upon it, became equal to the expense of land carriage to the port.

Now in the districts referred to, and indeed in Ireland generally, the charge for the land carriage for heavy articles is returned as being about 6d. per ton per Irish mile ; but a

great part of the produce of the country is purchased by jobbers, who are satisfied with a very small profit beyond the actual cost of conveyance from the place of purchase to the place of sale by their own horses and carts ; and it does not appear that such cost exceeds 6d. in any part of Ireland, 4d. per statute mile being more nearly the average, while it falls in some places, where there are good return loads, to less than 3d. In many parts of Ireland, in fact, a horse and cart can be hired for 2s. 6d. per day ; at that rate, supposing 15 cwt. to be drawn fifteen miles each day, the expense per ton per mile is 2½d., if only half-return loads be allowed the cost is 3⁵/₁₀d., and with no return load 5½d. ; but it is possible, in the last case, that a distance which requires three days with a loaded cart would be performed in two days when returning without burden, and that this sum would be reduced to 4½d. That land carriage in Ireland is as low as the amounts above given may be inferred also from the fact that some of the trade between Dublin and the West of Ireland is carried on by land, in preference to the Royal Canal, the charges upon which appear, from the returns made by that company, to be between 2d. and 3½d. per ton per mile. Another useful fact may be quoted from the Constabulary returns. The charges from Bagnalstown and Gores Bridge to Dublin, by the Barrow Navigation, amount to 18s. 3d. per ton ; but a drawback of 3s. 4d. per ton is allowed on all goods brought nine miles by land, and it may be supposed, therefore, that the canal expenses, together with nine miles of land carriage, are nearly equivalent to the cost of land carriage altogether from that neighbourhood to Dublin, making the latter between 3½d. and 3¾d. per ton per mile.

A railway offering the advantage of more speedy transit than common carts, which is not the case with a canal, would be almost certain to receive all the trade of that district within which it also proved more economical to employ it : and if the charge be supposed to be 2d. per ton per mile, which, to allow for the fare of a person accompanying the goods, and two changes of conveyance—one at the place where it receives the merchandise, the other at that of delivery—may be considered a total expense of 2½d. per ton per mile, while that of land carriage is taken at 3½d. ; the distance to the right and left from which commodities would be brought to the proposed line will be found to be a little more than one-third the distance from the port.

To ascertain the probable amount of agricultural produce forwarded from the district thus determined, the detailed accounts of exports from Ireland for several years prior to

1826 have been referred to, and for that period her annual exportation may be thus stated :—

Oxen	63,000 head	Barley	15,000 quarters
Sheep	70,000 „	Oats	1,500,000 „
Swine	70,000 „	Wheat	283,000 „
Butter.....	24,000 tons	Other Grain...	24,000 „
Bacon.....	18,000 „	Flour	19,000 tons
Beef	75,000 barrels	Oatmeal	10,000 „
Pork	107,000 „		

These are equivalent to about 437,000 tons, and supposing the increase since 1825 to be in proportion to the shipping cleared, the present exportation of the above articles may be considered to amount to 680,000 tons; and after allowing 20,000 tons for eggs, wool, flax, and potatoes, from the returns furnished by the Customs to the Commissioners, the total export of agricultural produce may be assumed with tolerable confidence at 700,000 tons annually.

To this must be added the consumption of the population of the ports. That population may be considered 700,000, and their consumption, with that of their horses, taken at three-fourths of a ton annually per person, make 525,000 tons.

It appears, then, that about 1,225,000 tons of agricultural produce are annually forwarded to the different ports, and the area of Ireland being about 20½ million acres, the average annual surplus per acre is about $\frac{1}{17}$ th of a ton; but if 3½ million acres be deducted for the larger tracts of mountain, bog, and water, this surplus may be considered to be obtained from 17 million acres, making an average of about $\frac{1}{14}$ th of a ton per acre.

The country through which the proposed line from Dublin to Cork would run being fully as fertile as any other part of Ireland, it is not probable that its surplus produce would fall below the general average, and one $\frac{1}{2000}$ ths of a ton has been accordingly assumed as the daily traffic occasioned by the transit of agricultural produce for each acre of the district considered likely to employ the railway.

From the ports the same districts, nearly, would be supplied with the various articles of import; the difference being, that imported commodities are only received in large quantities by dealers in the towns; the return trade, therefore, has been determined by observing what towns fall within the prescribed limits, and the amount of population supposed to be dependent on such towns.

The total import of Ireland, exclusive of coal, divided among the population, would give $\frac{1}{18}$ th of a ton to each person, but it is most probable that the consumption of Dublin, Cork, and the other great ports exceeds the general

average. It can hardly be above the truth, however, to assume that, including shop goods, beer, and spirits of Irish manufacture, the return trade would consist of 1 cwt. annually of different descriptions of merchandise for each individual of the population to be supplied, or a daily traffic of $\frac{1}{1000}$ th of a ton per person.

As with the heavy traffic, so also would the passengers for Cork, Dublin, or places along the line resort to the railway from different distances, according to the lengths of their proposed journey. There would be two inducements for such preference, leading to different results, with respect to the distance from which the traffic would flow to it, viz., diminished expense and increased speed. Assuming the fare of the railway to be 1½d. per mile, and that by the usual cars and caravans to be 1½d., passengers would employ it with the first object when their distances from the railway was not greater than $\frac{2}{11}$ ths of their journey by the common roads; and assuming the speed by the ordinary conveyances to be seven miles per hour, that by the railroad, including stoppages (which, as there would be probably but few trains, would require to be rather frequent) to be fifteen miles per hour, and also that a saving of one-eighth of the time required for the journey would be a sufficient inducement to undergo the inconvenience of a change of conveyance and risk of greater delay (by either missing or having to wait for the train) it would result that passengers would come to it with the latter object from places distant more than one-third of their proposed journey from the line.

It may, perhaps, be said that the traffic would flow obliquely to the railroad, and that passengers from the same place, by joining it at different stations, might perform their respective journeys either in the smallest possible time or at the least possible expense. Such, however, would hardly be the practical result of a railroad; regular conveyances would be established to it from the places that found it convenient to employ it, and these would generally run to the nearest station. To enter upon the subject more minutely would require the condition of the roads and local peculiarities of each place to be considered and be quite inconsistent with the character of the present estimate; this remark being only made to show that these circumstances were not overlooked.

With a wealthy community it is most probable that increased speed would be a greater inducement than diminished expense; with a poor one, and particularly with an agricultural one, expense is more likely to fix a limit to the traffic, and it has therefore been so considered.

With respect to the number of passengers likely to be

received at each station, the very valuable return obtained from the Grand Canal Company led to the method employed. The towns for which that canal is the best mode of conveyance must be in very similar circumstances to those on which the railway would depend: the fare by the canal is something less than that assumed for the railroad, but the increased speed of the latter may be considered as compensating the additional charge, and the passenger traffic on the one may be taken as a fair measure of that likely to fall upon the other.

Referring to the above return, it is found that the proportion of the population of the different places going within any stated period to Dublin, diminishes very regularly as the distance from Dublin increases.

Run from Edenderry, distance 38 miles, the daily proportion is	1	in	427
" Philipstown " 50 " " " " " " " " "	1	in	588
" Tullamore " 59 " " " " " " " " "	1	in	854

And these places have been taken as the measure for other places at the same distances, the Grand Canal being for them the most direct, as well as the cheapest line of communication to Dublin, which it is not for Rathangan and other places; while with Ballinasloe, Athy, Mountmellick, Kilbeggan, situated at the extremities of different branches of the navigation, the numbers are likely to be increased by passengers passing through from other towns.

From the conveyance returns, obtained from the Constabulary, it may be inferred that:—

From Lucan, distant $7\frac{1}{2}$ miles, the daily proportion is	1	in	56
" Leixlip " $9\frac{1}{2}$ " " " " " " " " "	1	in	58
" Celbridge " 14 " " " " " " " " "	1	in	91
" Clane " 19 " " " " " " " " "	1	in	140

From Cork, it appears by the enumerators' tables that four persons daily go to Dublin by sea; allowing an average of nine for the two mails and other land conveyances, we find that, at the distance of 160 miles, the proportion is about 1 in 8,000. From the enumerations made under and by the direction of the Commissioners, it also appears that the travellers by post and private carriages are about one-fourth of those by public conveyances, and that the foot passengers on journeys average more than one-half of the same.

A railway would probably receive all the former, but none of the latter.

From the foregoing, the following proportions have been arranged and employed in estimating the number of passengers between Dublin and the several places on or near the line:—

At the distance of	10 miles	1 in	50 daily
"	"	15 "	1 in 70 "
"	"	20 "	1 in 120 "
"	"	30 "	1 in 220 "
"	"	40 "	1 in 340 "
"	"	50 "	1 in 470 "
"	"	60 "	1 in 700 "
"	"	80 "	1 in 1,200 "
"	"	100 "	1 in 1,800 "
"	"	120 "	1 in 3,000 "
"	"	140 "	1 in 4,500 "
"	"	160 "	1 in 6,000 "

The only examples that could fairly be referred to for fixing proportions for the number of passengers passing between the country towns situated upon the same great line of communication are those given in the Grand Canal return of passengers between the places before mentioned, viz., Tullamore, Edenderry, and Philipstown. For them the canal affords a good and direct communication with each other, and not apparently competing with any regular land conveyances; but the intercourse between three places, near together, afforded hardly sufficient data to continue the estimate for passenger traffic upon this principle, and, therefore, after allowing for the intercourse between those towns which have Cork for their port and that city at one-half the number of passengers given by the above table for similar distances from Dublin, an addition of 50 per cent. has been made to the sum estimated to be received from passengers as an allowance for the travelling between towns upon and near the line, and for small parcels, this percentage being fixed by observing what proportion the number of passengers from Tullamore and Philipstown to places along the Canal bore to those for Dublin; and considering them to be conveyed, on an average, one-third the distance to the latter place on the above principles, the accompanying estimate is founded.

I hope the estimate and the description of the principles on which the maps have been constructed may prove satisfactory to the Commissioners; and have, etc.,

(Signed) H. D. HARNESSE, Lieutenant R.E.

Memorandum relative to the Estimate of Traffic on the Cork and Dublin Railway.

The enumerators' tables give 176 as the daily average number of passengers, by land, in one direction between Naas and Dublin; the Grand Canal return shows 30 to be the daily average, by water, between Sallins, Rathangan,

Monasterevan, Portarlinton, Mountmellick, Vicarstown, Athy, and Dublin; 11 go daily from Limerick and 4 from Cork, by water, to Dublin: total 221. The estimate now submitted, after including 18 for Tullow, Baltinglass, and Clane, makes the daily average from and through Naas to Dublin 306, being an addition of 30 per cent. to the above total; or, if the increase or the whole be compared with the travelling by land, the canal traffic being considered equal to that which a railway would receive of 38 per cent. It is hardly possible that the increase consequent on the construction of a railway should be less than this.

H. D. H.

On the conclusion of his work connected with the Irish Railway Commission the following letter was sent to him:—

Railway Commission Office,
Dublin Castle,

March 6th, 1838.

SIR,

The maps which you were directed to prepare for the Commissioners being completed, I have received their direction to convey to you their thanks for the great labour and attention you have devoted to the arranging the numerous and complicated returns which were placed in your hands for that purpose; and they have expressed themselves highly pleased with the manner in which you have executed the maps, which cannot fail to be documents of high interest to everybody connected with Ireland.

The Commissioners have perused, with much satisfaction, your letter explanatory of the principles on which the maps have been constructed. You appear to have considered the subject with great attention, and the amount of expected traffic according to your calculations may be regarded as a very close approximation to the truth.

The Commissioners being fully impressed with the great attention and time you have devoted to their service, have desired me to place to your credit, with Messrs. Cox & Co., the agents to the Corps of Royal Engineers, the sum of £200, which they think very reasonably due to you for the services you have afforded them, and they consider themselves fortunate in having had the benefit of such valuable assistance.

I remain, etc.,

(Signed) HARRY D. JONES,

Lieutenant H. D. HARNES,

Secretary.

Royal Engineers, Woolwich.

11.	On road from Cashel to 11½ miles from Tipperary and Fethard	Goods for the ...	20	30	85½	7	30	85½	2,315	5,145
		7	—	68	20	—	68	1,836	2,444
		—	9	98	—	9	98		
12.	One-half mile from Cahore, Tullow	Goods for the ...	—	5	68	—	5	68	1,889	3,132
		9	—	57½	24	—	57½		
		—	12	108½	—	12	108½		
13.	One mile from Mitchellsod for the 125½ miles from Dublin	Goods for the ...	—	5	57½	—	5	57½	1,046	1,237
		6	—	40½	20	—	40½		
		—	3	125½	—	3	125½		
14.	On road from Doneraile, 2¼ miles from Doneraile, 139 miles from Dublin	Goods for the ...	—	6	40½	—	6	40½	540	710
		4	—	27	16	—	27		
		—	1	139	—	1	139		
15.	In the town of Mallow, Tralee and Newmarket	Goods for the ...	—	8	27	—	8	27	861	2,722
		10	—	20½	32	—	20½		
		—	4	145½	—	4	145½		
16.	Cork, 166 miles from Dublin	Goods for the ...	—	38	20½	—	38	20½	—	5,976
		—	18	166	—	18	166		
									20,236	39,505
passengers between intermediate stations										
RECEIPTS—20,236 Tons of Merchandise										19,752
59,257 Passengers									TOTAL	20,236 59,257

In the above Estimate the Tons therefore to complete the Estimate, it is ch.

Taking then the quantities from
Add 50 per cent and passenger parcels ...

RECEIPTS—1,300
3,448

DAILY TRAFFIC.						Equivalent to over One Mile	
Towards Dublin.			Tow'ds Kilkenny.			Tons.	Passengers
Tons	Passengers	Distance	Tons	Passengers	Distance		
50	58	20	15	58	20	1,300	2,320
							1,160
						1,300	3,480

ARBITRATIONS BETWEEN THE POST OFFICE AND THE RAILWAY COMPANIES.

At the end of 1838, when Lieutenant Harness was employed as Instructor of Fortification at the Royal Military Academy, the Postmaster-General obtained permission of the military authorities for his employment as arbitrator to decide the terms upon which the mails were to be conveyed upon the railways under the powers of an Act of Parliament recently passed.

Principles first adopted by Harness in Settling Prices.

The price is to be calculated so as to return a fair profit on the expenses incurred by the company as carriers of passengers and goods, but not as railway proprietors. This principle closely approximates to the condition on which the Post Office expenses for carriage have hitherto depended. Mail coaches being generally exempted from tolls, the Post Office does not contribute either towards the first cost of roads, bridges, etc., or towards their repair, but pays all expenses incurred by contractors in carrying the mails, together with a profit fixed by competition. The Post Office will, therefore, not contribute towards the interest on capital expended on the first construction of the railway, nor towards the repair of the banks, bridges, etc., nor towards the expense of such parts of the establishment as are connected with the heavy traffic. The price is to be determined by ascertaining the amount of capital invested, or likely to be invested, in the necessary buildings, engines, tools, etc., for the passenger and light goods traffic, and allowing a return of $7\frac{1}{2}$ per cent. per annum, 6 per cent. as profit and $1\frac{1}{2}$ per cent. for repairs. The sum thus obtained is to be divided by the number of trips proposed when in full work, to be actually performed by the company; the amount per trip is to be again divided, so that the share to be paid by the Post Office may be in proportion to the gross weight taken in its service, when compared with the average gross weight of a passenger train exclusive of engine and tender.

The working cost of a trip, including the maintenance of rails, having been calculated, and the annual expense of direction, management, police, etc., having been allowed for, principally from the information afforded by returns, a proportion is charged to the Post Office as above explained.

Grand Junction Railway Arbitration.

His first appointment was dated December 3rd, 1838, and under it he had, in conjunction with Mr. J. Locke, M.P., to determine the terms upon which the mails were to be conveyed by the Grand Junction Railway Company between Birmingham and Liverpool, and between Birmingham and Manchester. The arbitrators selected Lord Stanley as their umpire, but as they ultimately agreed in their award his services were not required.

At the first meeting of the arbitrators, Harness informed Mr. Locke that he was of opinion that the monopoly possessed by the company should not be taken advantage of as against the Post Office, but that the price should be calculated as it would be by a party making a tender when there was a fair but not ruinous competition; viz., by considering what the actual expense of executing the work might be in addition to his other business, and then determining the remuneration in proportion to his trouble, of which the expense might be considered the measure. Mr. Locke signified his agreement to these principles as those on which he was willing to take up the question.

At a meeting of the arbitrators held on the 9th January, 1839, Harness submitted his views as to the terms on which the question should be settled. These were:—

1st. To ascertain the actual expense of performing the Post Office service in addition to the other traffic.

2nd. The expense being ascertained, to determine the remuneration by considering the profit that must be derived from each ton of load in order to pay 10 per cent. on the capital in the event of a maximum traffic.

3rd. In calculating the price for the work to be performed, to add the toll actually paid on account of the Post Office to the working expenses, but to calculate the profit on the carrying capital only at 6 per cent.

The times of the trains by which the railway company were required to carry the mails were:—

Two mails from Birmingham at	3.8 a.m.	{ delivered at Liverpool & Manchester }	at	7.53 a.m.
One mail „ „	11.30 „	„	at	4.15 p.m.
„ „	5.0 p.m.	„	at	9.45 „
One mail from { Liverpool and Manchester }	2.45 a.m.	{ delivered at Birmingham }		7.54 a.m.
„ „	11.30 „	„		4.30 p.m.
„ „	5.58 p.m.	„		10.58 „

The question of the actual expense was then discussed, Locke asking Harness whether he would agree to pay for locomotive power in the proportion of the weight taken for the Post Office to that of the whole train. Harness replied that he could only pay for the additional expense of engine power required in consequence of the addition of the mail to the train. Locke rejoined that if the expense was to be measured thus rigidly, he would have to take into account any inconvenience caused by the Post Office service. After further discussion Locke proposed to charge the Post Office three-fourths of the existing fares, based upon the calculation that the expenses were half the receipts, that half the fares charged may therefore be considered expenses, that the dividends are 10 per cent. per annum, and that, therefore, the proposed charge would be equivalent to calculating the expenses and giving a remuneration of 5 per cent. on the capital.

In reply, Harness expressed the opinion that Locke's proposal was a reduction of 25 per cent. on prices, a reduction which any tradesman will allow to large customers, even although his expenses are much more than half his receipts, and that the Post Office had a fair claim for larger concessions than would be granted in a commercial transaction.

At a final meeting on January 17th, 1839, the arbitrators signed an award by which the Post Office were to pay £15 a day for each of two trains, viz., an early morning mail from Birmingham, and an evening mail from Liverpool and Manchester; £5 a day for each of three trains, viz., midday and evening mails from Birmingham and midday mail from

Liverpool and Manchester ; £20 a day for the early morning mail from Liverpool and Manchester ; £2 10s. a trip for the supplying of an extra horse box or extra carriage when required.

On September 4th, 1841, Locke and Harness were again appointed arbitrators, to settle the price to be paid by the Post Office to the Grand Junction Railway Company, for the conveyance of mails between Crewe and Chester, Mr. J. Wilson Patten, M.P., being selected as umpire. The arbitrators having been unable to agree, Harness thinking £6 10s. per day sufficient, while Locke estimated the sum at above this amount, the case was submitted to the umpire, who awarded £7 10s. per day as the price to be paid.

Harness's Opinion as to Principles.

In February, 1841, Harness reported to Colonel Moberley, the Secretary to the Post Office, his opinion as to the principles by which arbitrators should be guided in determining the price to be paid for the conveyance of mails by railway, viz. :—

They should be instructed to consider the railway company as (1) providers of locomotive power, (2) providers of carriages, and (3) proprietors of a road.

Under the first item they should ascertain the expense of the company in running their engines, and add to it such further sum as will allow a return of 5 per cent. on engine stock. If the trains carrying the mails obtain a fair share of general traffic, the Post Office should pay for locomotive power, thus estimated, in proportion to the weight it attaches to the train as compared with the average weight of passenger trains on the line ; but if the receipts are small, the Post Office should make up the difference between the whole expense and so much of it as may be considered (by comparing the price of power with the average receipts of the trains) to be paid for by the general traffic.

The rate per mile agreed to by the railway companies for the use of each other's carriages may be made the law to the arbitrators in estimating the second item.

The toll to the road should be calculated at such a rate as would allow a return of 10 per cent. on the capital

in shares, in the event of a traffic equal to that passing over such passenger line as may at the time of the arbitration be doing most business.

When a mail train passes at night over lines not open for night traffic, the arbitrators should be empowered to award, after examining evidence on oath, a payment for extra attendance of police or watchmen, or other accommodation necessary for running a train, such payment, however, to be separately stated in the award and to cease when the line is open for other night traffic.

On a General Rule for Railway Charges for Post Office Work.

In consequence of a communication from the Treasury of April 26th, 1841, asking for information on certain points, Harness replied as follows, on May 31st, 1841 :—

1. The circumstances which lead to varying rates of charge on the several railways are differences in the nature of the services and in the convenience for general traffic, of the hours at which they are performed. The services required by the Post Office may be thus classed :—

(a) A small extent of accommodation, as a guard's seat and imperial or one compartment of a second class carriage by trains convenient for general traffic, as the day mails on the South Western Railway.

(b) A large extent of accommodation, by trains convenient for general traffic, as the mails on the London and Birmingham Railway, the night mail on this line adding a gross weight to the train of about 8½ tons.

(c) The despatch of trains at hours or under circumstances inconvenient for general traffic, as all the trains on the North Union line at the time of arbitration and as the night mails on the South Western line for a part of their distance.

(d) The despatch of a train at hours when the line would not otherwise be open for traffic, as the train leaving Lancaster for Preston at 2 a.m., and as both the trains on the Birmingham and Derby line.

In the first two cases the prices should vary with the weight added to the train. In the third case if the receipts are insignificant the expense of the train must be paid by the Post Office ; if not insignificant the charge to the public ought to be diminished as the receipts increase. In the fourth case, several important additional expenses are incurred, as extra wages of police, gate-keepers, and

watchmen, fuel for pilot engines, and wages for their drivers. In one instance a charge for increased expense of maintenance has been admitted, in consequence of the line not being clear at night.

2. As to the cost of mail conveyance compared with the payments made by the Post Office at the time of arbitration, the former has been about two-thirds of the latter in the several prices proposed or agreed to, when the trains have been convenient for traffic; but in two such cases the umpires have awarded about double my estimate; and on the Grand Junction line, I believe, the working expenses, particularly those connected with locomotive power, have been much reduced since the prices were established. Where trains are especially run for the Post Office, the remuneration is about 25 per cent. on the expenditure, supposing the latter unchanged since the period of arbitration. When extra expenses have been charged for keeping a line open at night, no additional profit has been allowed and the remuneration is therefore less than 25 per cent. The proposal to charge a profit on such extra expenses is at the present time one subject of difference between Mr. Robert Stephenson and myself, in a case referred to Sir John Burgoyne as umpire.

I must, however, add to the above that the principle of estimating the price by a percentage on the expenses has not been observed on my part in any of the arbitrations, for there is no fixed percentage applicable under all the circumstances. As the proportion between current expenditure and invested capital is varied, so must the percentage on expenditure, which will afford a fair return, be varied; where there is no fixed capital, interest for the interval between disbursement and repayment of the current expenses being sufficient remuneration. It is preferable, therefore, as a general rule, to calculate the remuneration partly as interest on additional stock required in engines and carriages; and partly as a toll towards fixed expenses and interest on capital in the road, on the gross weight (*i.e.*, including the weight of the carriage) conveyed for the Post Office.

3. Whether under the existing law the rates of charge may be expected to increase or decrease hereafter, I am of opinion they are likely to increase; because if no rule is established for computing the payment for the mails (and the present law contains none), the prices exacted by the principal lines from the branch lines will form important precedents to the umpires, especially when

a few years have removed the ideas of privilege associated with a mail. These prices are likely to be exorbitant; that demanded by the London and Birmingham Company for a train to accommodate the Midland counties is an example of the principle on which it is probable they will be founded; it was the difference between the receipts and the fares of sixty passengers, and as the train was allowed to stop only at the water stations, that it might not interfere with the traffic of the London and Birmingham trains, the passengers consisted, almost exclusively, of persons travelling between London and places on or beyond the Midland Counties Railway. But if any tolerably just principle of computation be established by law, the prices for the mails will be diminished; for in every arbitration which has yet occurred, the line had been too recently opened to supply perfect data for calculation. The working expenses are, I believe, lower than they were assumed, and time will no doubt produce improvements and considerably diminish them.

4. In reply to the fourth and last subject referred to me, I must suggest the addition of a clause to the present Act for regulating the conveyance of the mails by railways, defining the principle on which the prices for the mails shall be calculated, and what privilege, with respect to toll, shall be conceded to the Post Office; and I propose the following as a just basis on which to frame it:—

The arbitrators to be directed to consider the railway company as (*a*) providers of locomotive power, (*b*) providers of carriages, and (*c*) proprietors of a road.

(*a*) For the first item the expense to the company of running their engines to be ascertained, and such sum added to it as will allow a return of 5 per cent. on engine Stock. If the mail train obtains an average share of general traffic, the Post Office to pay for locomotive power, estimated in proportion to the weight it attaches to the train, as compared with the average weight of the passenger train; but if the receipts of the train are small, the Post Office to make up the difference between the whole expense, estimated as above, and so much of it as may be considered (by comparing the price of power with the average receipts of the trains) to be paid for by the general traffic.

(*b*) The rate per mile at present existing by agreement between the railway companies, as the charge for the use of each other's carriages, to be made the law to the arbitrators in estimating the second item.

(*c*) The toll to the road to be calculated at such rate

per ton gross (or including the weight of the carriages) as would yield a return of 10 per cent. on the capital shares in the event of a full traffic on the line, or it may be fixed at $\frac{1}{2}$ d. per ton gross per mile for all lines of which the cost has not exceeded £10,000 per mile, with an increase of $\frac{1}{2}$ d. per ton gross per mile for each additional £10,000 per mile expended on the road.

And when a mail train at night passes over lines not open to night traffic, the arbitrators should be empowered to award, after examining evidence on oath, a payment for extra attendance of police or other accommodation necessary for running an engine with the mail; the amount, however, to be separately stated on the award, and to cease when the line is open for other night traffic.

Thus calculated, the prices by ordinary trains would be from 1d. to 2d. per ton gross per mile, depending on the cost of the line. The profit from the same cause varying from 25 to 150 per cent. on the actual expenses for power and carriage. The cost of a special train, when there are no circumstances to occasion extra expenses, would probably be from 1s. 10d. to 2s. 2d. per mile, the payment exceeding the expense from 15 to 35 per cent. Supposing extra expense of 6d. a mile to be incurred, the profit would be from 12 to 28 per cent., and if these additional charges amounted to 1s. per mile, which they have done in two instances, the price would exceed the working expenses by from 10 to 22 per cent.

I also recommend provision being made for an annual revision of the price; within a year all the circumstances producing high prices may have changed; those producing low prices are not so likely to change; and at present there is an inducement to the companies to create inconveniences prior to arbitration, which it is impossible to prove, if suspected. The necessity for a provision of this kind was so apparent to Sir John Burgoyne, when acting as an umpire in a recent case, that he wrote to me on the subject.

Next, that some power of checking the receipts of the mail train be given to the Post Office; or at least that the receipts, as well as any documents required during an arbitration, shall be sworn to. The servants of a company ought to be incapacitated from acting as arbitrators in cases concerning that company; in one instance the secretary has been appointed. Lastly, the Post Office should adopt some means to ensure the comfort and convenience of passengers by the mail trains being attended

to, and to ascertain that no impediments exist as to travelling by them.

North Union Railway.

On February 25th, 1839, Harness and Mr. Vignoles were appointed arbitrators to determine the price to be paid by the Post Office for the conveyance of the mails between Preston and Parkside, Sir John Burgoyne being elected as umpire.

The arbitrators agreed upon their award, viz., that £20 a day should be paid for the service required, the same being subject to be reconsidered within a short period.

In May, 1841, the matter was again submitted to the arbitration of Harness and Mr. Chapman, the Secretary to the North Union Railway Company, Mr. Maude, a stipendiary Magistrate at Manchester, being selected as umpire. The sum of £20 15s. per diem was claimed by Mr. Chapman, Harness thinking £7 11s. sufficient. The umpire awarded £12 3s. 6d. per day as the sum to be paid.

London and South Western Railway.

On November 27th, 1840, Harness and Mr. Locke, M.P., were appointed arbitrators to settle the terms to be paid for the conveyances of the day and night mails between London and Southampton, Mr. Wilson Patten, M.P., being selected as umpire. In this case the arbitrators did not agree, Mr. Locke estimating the cost at £22 2s. or £23 13s. per diem (these sums being arrived at by two different methods of calculation), and Harness at £15 13s. per diem. The umpire awarded £17 6s. 4d. per diem as the amount to be paid.

On August 17th, 1841, a second case as to the cost of a special train for the conveyance of the Indian mail from Southampton to London was submitted to the same arbitrators and umpire. Mr. Locke's estimate was £19 5s. per diem (at the rate of 5s. a mile), Harness's £9 14s. per diem, the umpire fixing the amount at £14 per diem.

On February 24th, 1842, the revision of the charges in force for the conveyance of mails on this railway was again referred

to the same arbitrators and umpire. Mr. Locke's claim was £27 8s. 4d. per diem, Harness's estimate £15 13s. 3d. per diem, the umpire awarding £22 2s. per diem as the price to be paid.

Birmingham and Gloucester Railway.

On April 14th, 1841, Harness was appointed arbitrator to settle the price to be paid for the conveyance of mails on this railway, the railway company appointing Mr. Ellis, Mr. Gisborne, M.P., being selected as umpire. Mr. Ellis claimed 3s. 3d. per mile run, or £33 12s. 5d. per diem; Harness's estimate was 2s. 1d. per mile, or £21 9s. 2d. per diem; the umpire awarding 2s. 10½d. per mile, or £29 8s. 9d. per diem as to the amount to be paid. The award, however, not having been given within the period prescribed by Act of Parliament, a fresh umpire had to be selected, viz., Sir J. Eardley Wilmott, Bart., M.P., and he awarded 2s. 7½d. per mile, or £27 1s. 5d. per diem, as the sum to be paid.

A further question was referred on September 13th, 1844, to the same arbitrators, with Mr. Wilson Patten as umpire, in consequence of a change in the arrangements of the trains having taken place. The arbitrators agreed on a payment of £4 17s. 2d. per diem, and had not to submit the question to the umpire.

Midland Railway.

On December 2nd, 1840, Harness and Mr. Vignoles were appointed arbitrators to settle the price to be paid for the conveyance of the mails between Rugby and Derby, Sir John Burgoyne, R.E., being in the first instance selected as umpire, and then, as he was unable to give a decision within the legal time, Colonel Harry Jones, R.E. The sum proposed by Mr. Vignoles was 4s. per mile, and by Harness 1s. 1d. per mile, the umpire awarding 1s. 5½d. per mile.

A further question as to the sum to be paid for the conveyance of the mails between Nottingham and Derby, was submitted to the arbitration of Harness and Mr. Ellis on February 14th, 1842, Colonel Rolleston being appointed

umpire. In this case the arbitrators agreed upon the sum to be paid, viz., £4 per diem.

On December 30th, 1846, the amount to be paid for the conveyance of the night mails from Lincoln to Nottingham was submitted to the decision of Harness and Mr. W. H. Barlow. Harness was, however, prevented by other duties from acting in the case, and Captain Williams, R.E., was appointed in his place, Mr. Wilson Patten, M.P., being selected as umpire. Mr. Barlow's claim was 21s. 3d. per mile, Captain Williams's estimate 9s. 7d. per mile, the umpire's decision being 11s. 3d. per mile.

York and North-Midland Railway (now North-Eastern).

On December 14th, 1840, Harness was appointed arbitrator on the part of the Post Office, to determine the amount to be paid for the conveyance of the mails between York and Normanton and other places, Mr. R. Stephenson being arbitrator for the company; Sir John Burgoyne was selected as umpire. The arbitrators agreed upon their award, which fixed £7 4s. per diem as the price to be paid.

A second reference was made to the same two arbitrators on November 22nd, 1841, when an agreement was arrived at for a mileage rate of 2s. for a morning train, and 6d. for an evening train.

A third case was referred to the arbitration of Harness and Mr. Hudson, chairman of the railway company, on April 7th, 1843, the Hon. J. Stuart Wortley, M.P., being selected as umpire. Mr. Hudson's claim was 1s. 8d. per mile for up trains, and 8d. a mile for down trains, Harness's estimate being 4½d. a mile for either up or down trains. The umpire awarded 1s. 8d. a mile for up trains and 8d. a mile for down trains.

North Midland Railway.

On August 18th, 1841, the question of the price to be paid for the transmission of the mails between Derby and Leeds was referred to the decision of Harness and Mr. R. Stephenson, Lieut.-Colonel Sir F. Smith, R.E., being selected as umpire.

Mr. Stephenson claimed a mileage rate of 1s. 10½d. Harness thought 9½d. sufficient, and the umpire awarded 11½s. per mile as the sum to be paid.

Edinburgh and Glasgow (now North British Railway).

On June 14th, 1842, the price to be paid for the conveyance of the mails on this railway was referred to Harness as arbitrator for the Post Office, Mr. Miller, engineer of the railway company, being selected to act for them, and Lord Kelburne, M.P. for Ayrshire, having agreed to act as umpire. The accommodation required was for a guard and imperial in a first class carriage by the 11 a.m. train from each end of the railway, which is forty-six miles in length. The arbitrators were unable to agree, Harness fixing 2s. 3d. a trip as a proper price, and Mr. Miller 16s.

The umpire's decision in this case was 11s. 6d. a trip.

On June 21st, 1843, the Post Office again appointed Harness as arbitrator, to decide the price to be paid for the conveyance of three additional trains each weekday on this railway, the other arbitrator and the umpire being the same as in the former case. The arbitrators were able to agree on a sum of £6 3s. per diem as the price to be paid for the three trains, a sum considerably in excess of that allowed in the previous case, owing to one of the trains being run solely for the Post Office.

Newcastle and Carlisle Railway.

On June 21st, 1842, Harness was appointed arbitrator for settling the price to be paid for the conveyance of the mails on this railway, the arbitrator on the part of the railway company being Mr. John Blackmore, an officer of the company, Professor Peter Barlow consenting to act as umpire.

The length of the railway was fifty-nine miles, and the accommodation to be provided was equivalent to the fourth part of a second class carriage in one train each way per diem.

The arbitrators could not agree, Harness fixing the price at 2½d. per mile, Mr. Blackmore at 6d., and the umpire awarding 4½d., a sum which Harness thought excessive.

Chester and Birkenhead Railway.

On November 29th, 1842, Harness was appointed arbitrator to decide the prices to be paid for the conveyance of mails on the Chester and Birkenhead Railways, Mr. R. Stephenson acting on the part of the company, and Lieut.-General Sir F. Smith, R.E., being selected as umpire.

The arbitrators being unable to agree except in the case of one train, Mr. Stephenson asking 4s. 5d. per mile, and Harness considering 1s. 4½d. for the morning mail and 1s. 10½d. for the evening mail sufficient, the case was submitted to the umpire, who awarded 1s. 7½d. per mile for the morning train and 2s. 5½d. for the evening train.

Great Western Railway.

The price to be paid for the conveyance of the mails on this railway was submitted to Harness as arbitrator on February 14th, 1843, Mr. Saunders, the Secretary of the railway company, being selected as the other arbitrator, and Mr. Pusey, M.P. for Berkshire, being appointed umpire.

For the conveyance of the mails (1) between London and Bridgewater, and on the Cirencester Branch, and (2) between London and Taunton, and on the Cirencester Branch, after considerable discussion between the arbitrators and umpire, Mr. Saunders asked for (1) £50 16s. 8d., and for (2) £55 15s. 5d. per diem respectively, Harness considering £29 7s. and £31 9s. sufficient, and the umpire awarding £46 3s. 7d. and £49 6s. 3d. as the sums to be paid. This award Harness strongly objected to as being at variance with a previous expression of the umpire's opinion.

The law officers of the Crown having given their decision that the umpire's award was illegal, owing to his appointment having been improperly made, the Post Office refused to pay the sum of £48,305, which was that claimable under the award upon which the railway commenced an action against the Post Office to recover the amount. This action was fixed to be heard on June 22nd, 1844. The papers in my possession

make no mention of its having been heard ; but as in the month of July, 1844, a fresh arbitration was arranged, Mr. D. L. Maude, a magistrate of Manchester, and Mr. Brunel, being appointed arbitrators on the part of the Post Office and railway company respectively, it is probable that the legal proceedings were stayed on the understanding that the matters in dispute should be again submitted to arbitration, and that fresh arbitrators should be appointed. Owing to Mr. Brunel's engagements the arbitrators, who had selected Mr. G. C. Lewis as umpire, did not enter upon their duties till February, 1845. The arbitrators did not agree, but the matter had to be submitted to the umpire, who made his award in May, 1845, making the payment due from the Post Office £45,920, Harness expressing the opinion that it was unreasonable. Mr. Maude's award proposed sums rather less than those named by Harness in the previous arbitration, Mr. Brunel's being far in excess of those of Mr. Saunders. Upon Harness's advice, the Post Office consulted Mr. Wilson Patten, who had acted as umpire in previous arbitrations, with regard to the reasonableness of Mr. Lewis's award ; and Mr. Wilson Patten having stated that he considered the proposed charges unreasonable, the matter was, in August, 1845, submitted to a fresh arbitration, Harness and Mr. Brunel being appointed arbitrators.

After a protracted correspondence and one meeting in May, 1846, the arbitrators had not been able to agree upon the choice of an umpire by February, 1847, after which date there is no further reference to the matter in Harness's memoranda. I have, however, ascertained from the General Post Office that in May, 1847, when Harness became Secretary to the Commissioners of Railways, an umpire having still not been agreed upon, Captain John Williams, R.E., succeeded Harness, Mr. Brunel having, at the end of 1847 or the beginning of 1848, been replaced by Mr. Saunders : the new arbitrators selected Sir William Molesworth as umpire. The arbitrators not agreeing, the services of the umpire were called

in, and on the 20th June, 1848, he issued his award, and directed that a payment of £143,918 should be made for services rendered from June 22nd, 1844, to June 20th, 1848. As this averages a sum of about £98·5 per diem (more than double the amount awarded by the umpire, and which Harness considered excessive), it must no doubt apply to a much longer mileage than when the subject was originally submitted to arbitration in February, 1843.

Manchester and Leeds Railway.

On August 10th, 1841, Harness was appointed arbitrator to settle the price to be paid for the conveyance of mails on this railway, Captain Lawes, R.N., the Superintendent of the company, being appointed to act on their behalf. Mr. J. F. Foster, Chairman of Quarter Sessions for the Manchester District of Lancashire, was agreed upon as umpire. The question to be decided was the cost of conveyance of mails between Manchester and Leeds, a distance of sixty miles, and between Manchester and Normanton, a distance of fifty miles.

On August 20th, 1841, the arbitrators agreed upon their award without having to consult the umpire ; this amounted to an average price of 1s. 3d. per mile.

An alteration of the train service having taken place in the following January, the solicitors decided that the award was rendered null and void, and a fresh arbitration became necessary, the same arbitrators being appointed on June 12th, 1843, and the same umpire being agreed on. On July 4th, 1843, the arbitrators gave their award, which reduced the cost of conveyance from 1s. 3d. to about 11d. per mile.

Eastern Counties Railway.

On March 5th, 1844, Harness and Mr. Hall, of Stratford, Essex, were appointed arbitrators by the Post Office and railway company respectively, to fix the terms for the conveyance of the night mail between London and Colchester. They fixed upon Mr. Wilson Patten, M.P., as their umpire. On the 23rd March, 1844, the arbitrators agreed upon an

award of 1s. 8d. per mile, and the question had, therefore, not to be submitted to the umpire.

On February 14th, 1846, Harness and Mr. Bidder, C.E., were appointed arbitrators, to settle the terms to be paid for the conveyance of the night mail between Yarmouth and Ely, a distance of seventy-four miles. Mr. Wilson Patten was again appointed umpire. The arbitrators not being able to agree, Mr. Bidder's proposal being 3s. 1½d. per mile, and Harness's 1s. 9¾d., the question was submitted to the umpire, who, on May 21st, 1846, awarded 2s. 1d. per mile as the amount to be paid.

Lancaster and Preston Railway.

On November 30th, 1840, Harness and Mr. Joseph Locke, C.E., were appointed arbitrators on the part of the Post Office and railway company respectively, to settle the terms to be paid for the conveyance of the mails on that railway. Again they agreed upon Mr. Wilson Patten, M.P., as umpire. The services of the umpire were not, however, required, the arbitrators having agreed as to the terms, viz., a sum of £14 per day; Harness's amount being £12 18s. and Mr. Locke's £15 1s.

In consequence of an alteration in the postal arrangements a further reference to the same arbitrators and umpire was made on September 11th, 1841, when the arbitrators agreed that a reduction of £1 per diem should be made upon the sum of £14 originally awarded.

Birmingham and Derby Railway.

On March 15th, 1841, Harness and Mr. R. Stephenson, C.E., were appointed arbitrators for the Post Office and railway company respectively, to settle the terms for the conveyance of the mails on the railway, Major-General Sir J. F. Burgoyne having been agreed upon as umpire.

Harness's award was 2s. 8½d. a mile, Mr. Stephenson's 3s. 11¾d., and on the matter being submitted to the umpire he settled, on June 2nd, 1841, that 3s. a mile was the proper sum to be paid.

Hull and Selby Railway.

On April 5th, 1841, the price to be paid for the conveyance of the mails between Hull and Selby, a distance of 30 $\frac{1}{4}$ miles was referred to arbitration, Harness being appointed arbitrator by the Post Office, and Mr. Locking, Secretary to the railway company, by the latter body. The arbitrators selected Mr. P. Barlow as their umpire. They were unable to agree, Mr. Locking's claim being 2s. 9d. a mile, Harness allowing only 4 $\frac{1}{4}$ d. a mile, and upon reference to the umpire, he, on June 2nd, 1841, awarded 9 $\frac{1}{4}$ d. a mile as the amount to be paid.

Owing to altered arrangements in the running of the trains, the matter was again, on June 25th, 1842, referred to the same arbitrators, who selected as their umpire the Hon. C. R. Langdale.

In this case Harness's estimate was 5·28d. per mile, Mr. Locking's 1s. 9d. per mile. The umpire, on August 20th, 1842, awarded 1s. per mile as a reasonable charge.

In consequence of a further alteration in the running of the mail trains, a third arbitration became necessary, and was on July 26th, 1843, submitted to the same arbitrators as in the last case, Mr. R. Bethell being selected as umpire. The arbitrators again failing to agree, the terms proposed by Harness being 5 $\frac{1}{4}$ d. per mile, by Mr. Locking 3s. 6d., and the umpire fixing 9d. per mile as the proper amount on October 25th, 1843.

Great North of England Railway.

On October 28th, 1843, the question of the terms to be paid by the Post Office for the conveyance of letters on this line between York and Darlington, a distance of forty-eight miles, was referred to Harness and Mr. R. Stephenson as arbitrators, on behalf of the Post Office and railway company respectively, Lieut.-General Sir F. Smith being selected as umpire. His services were not, however, required, the arbitrators having, on November 23rd, 1841, agreed upon the terms, viz., 7d. per mile.

Glasgow and Paisley Joint Railway.

The settlement of the terms for the conveyance of the mails on this railway (about seven miles in length) was on November 28th, 1843, in the first instance referred by the Post Office to Harness as arbitrator, Mr. Errington, Engineer of the railway, being selected by the railway company, and Mr. H. J. Robertson, Sheriff Depute of Renfrewshire, having consented to act as umpire. In consequence of an informality in the first appointment of Mr. Errington, and delays which ensued with reference thereto, fresh appointments were made, dated 20th December, 1844.

The arbitrators having been unable to agree upon their award, Harness thinking 1½d. per mile sufficient, Mr. Errington claiming 3d. per mile, the umpire had to be called in, and awarded, on July 26th, 1845, 2½d. per mile as the proper charge.

In addition to these arbitrations, Harness was frequently consulted by the Post Office on matters connected with terms for the conveyance of mails other than those decided by arbitration.

It will be observed that in the majority of cases submitted for the decision of an umpire the awards tended to support Harness's views rather than those of the arbitrators (some of them men of great eminence) selected by the railway companies.

In May, 1847, Harness became joint Secretary, with the Hon. P. Bruce, to the Commissioners of Railways, and upon these being merged in the Board of Trade, Harness became sole Secretary, a post which he retained till October, 1850, when he was appointed Deputy Master of the Royal Mint.

I regret that I have been unable to obtain an accurate record of the services rendered by Harness when employed as Secretary, first under the Railway Commissioners and then under the Board of Trade, but the official papers relating to this period do not contain the information which I had hoped to procure.

C. S. H.

CHAPTER III.

THE REFORM OF THE ROYAL MINT, 1850-54.

By GENERAL J. H. WHITE, R.E.

(Formerly Bombay Engineers.)

IN April, 1850, Captain Harness was appointed Deputy Master of the Royal Mint: "a period of emergency had occurred there," which, as Sir C. Trevelyan wrote to Captain Harness, "occasioned your employment there." What that emergency was, and what the condition of administration of the Mint, may be stated briefly, in order to show the difficulties with which any newly appointed officer would have to contend: these may be gathered chiefly from the Report of the Royal Commission appointed in 1848 to inquire into the constitution and administration of the Royal Mint, and from a short Memorandum written on the Mint in 1870 by Sir C. W. Freemantle and Sir C. Rivers Wilson.

It appears that before 1851 the coinage of Great Britain had, with one brief exception, been carried out from the earliest time by contract, entered into either direct with the Mint Master, or indirectly through him with the "Moneyers," or, as was eventually the case, by direct agreement with the Mint Master, the Mint Master having become a salaried officer of the Government.

The position of the Moneyers, as reported by the Royal Commission, was of a remarkable nature. They were not

appointed by any public authority, but formed a body continued by self-election, assuming to possess legal corporate rights and claiming the exclusive privilege of executing that part of the coinage work customarily confided to them, which they insisted could not, without a violation of their prescriptive rights, be entrusted to other hands.

This claim it is clear was a serious one, for it appeared to the Commissioners that if the exclusive legal right could be substantiated, no change in the operative system would be practicable without the concurrence of the claimants. After careful inquiry, however, they came to the conclusion that the Moneyers' claim of exclusive right rested on no more substantial ground than ancient usage, and that if the abolition of their long exercised privilege of exclusive employment should even give them a title to pecuniary compensation for the loss of its advantages, they had in no way established their right to its perpetual continuance.

The Commission, moreover, having decided that the execution by contract of any part of the work appertaining to coinage should cease in every form and degree, it became one of Captain Harness's first and most important duties to replace the services of these contracting officers by—in the words of the Royal Commission—"those of competent officers acting wholly in the public interest and unconditionally subject to the controlling authority of the head of the establishment."

This was apparently a troublesome matter, and the difficulties were such in introducing the new system that it was not till 10th February, 1851, that the notices to the Moneyers were finally served. The Mint did not then at once proceed to carry out the coinage directly by Government officers, but curious to say called for tenders for performing the work by contract, although the Commissioners had recommended that execution by contract of any part of the work appertaining to coinage should cease in every form. This was probably due in some measure to an apparent change of opinion on

the part of the Master of the Mint, Mr. Sheil, a member of the Commission who subsequently expressed to the Treasury "a strong persuasion that the coinage should be carried on by public contract *open to competition, etc.*;" and in part to the opinion of Captain Harness, who was also in favour of a modified contract system, with which Sir John Herschel, who was appointed Master of the Mint a few months after Captain Harness joined as Deputy, concurred.

Captain Harness stated that for "every description of work for which there would be sufficient competition, and the proper execution of which can be secured by inspection, a contract system must be the most economical for the Government to adopt. The man who is best qualified to conduct the work is the man who can afford to make the most liberal offer, and in the selection of those he employs he is secure from interference of any interest opposed to the economical management of his business. It is far more easy for the Government to select a careful and honest person to approve of the work of a contractor, than to select an energetic and yet economical director and skilful superintendents for a manufactory. . . . The only duty which it appears necessary for a Government to perform under all circumstances being the verification of the weight and quality of the coins before they are allowed to be used, and this, perhaps, may be considered to include stamping them. . . ."

"If this be true, a Mint establishment should be so arranged that advantage may be taken of changes of circumstances, the verification of the coin and the formation of the dies being the only parts of the establishment, with the exception of the registry and accounts, in which the possibility of change should not be contemplated."

"In this view Mr. Shiel concurred. In a report sent in in October, 1850, in which he informs the Lords of the Treasury of the measures he recommends for the reform of the establishment, he says: "While, however, I abide by the opinion expressed by the Commissioners in reference to the

Company of Moneyers, I conceive it to be incumbent on me to state that the views which have been suggested to me by Captain Harness, who has been recently appointed Deputy Master of the Mint, and who, by his devotedness to the duties of his office and the zealous and indefatigable exercise of his talents, is likely to confer great services on the Department, have produced in my mind a strong impression that the coinage should be carried on by public contract open to competition. . . ."

Tenders were accordingly called for, and sent in by Messrs. Rennie, Messrs. Maudsley, and Mr. Nutting : the terms, as the Memorandum states, were no doubt unnecessarily stringent, but the tenders were very high. The result was that none of them were accepted, and arrangements were made for carrying out the coining, as also the melting operations by Government officers, which arrangements, with slight alterations, have been continued up to this day. In a brief Memoir of this kind it is not advisable to enter into any discussion on the principles of Minting, but it may perhaps be remarked that the result which was arrived at was probably the best one ; and although there is much to be said for Captain Harness's view of the question, it does seem preferable, at least in these times, that the very important work of the coinage of a country should be carried on by a select body of men of the highest training and probity, tied to the Government by steady employment and future pension.

In the Melting department there were not the same difficulties as in the case of the Moneyers. Though the Melter was not a salaried officer of the Government, his appointment was founded solely on his agreement with the Master of the Mint ; he was "*officially* entrusted with the Melting operations, and *commercially* paid for executing them" ; but as his appointment was revocable at three months' notice, his case could be easily dealt with. The Melter, Captain Harness says in a draft report, which, with some alterations and additions, was accepted and signed by

Mr. Shiel, "is a contractor living and carrying on within the Mint an extensive private business as a refiner of bullion. This arrangement appears inconsistent with a well regulated Government establishment, and not likely to have been attended with profit to the public. . . . It is proposed to abandon the refinery, to employ one person on a fixed salary as Melter, and as his duties in the Melting House will most probably not nearly employ his time, to consider himself attached to the Mint Office." Mr. Shiel agreed with this; he wrote :—

"In my opinion the melting of gold, which constitutes the standard metal . . . should be entrusted to a functionary of the Mint paid by a regular and fixed stipend, but I see no objection to the Master of the Mint calling for tenders for the supply of silver of standard fineness in bars fit for immediate coinage. . . ."

This, of course, could have been carried out, though it might have entailed delay in Mint operations; however, as above stated, the Melting and Coining operations were both handed over to salaried Government officers.

As regards the provision of dies for coins and medals, Captain Harness's opinion was against the continuance of the existing system, which allowed the head engraver, who was an artist of high standing in his profession, to carry on private in addition to his official work within the Mint; he proposed to retain but one engraver in the Mint, and to consider him attached to the Superintendent of the Machinery and Die Office, and to obtain new matrices when required from different first-rate artists. This is the system which it is believed still rules in the Royal Mint, and it cannot be doubted that it is the best; there cannot always be employment for a first-rate artist, except in times of great pressure; all the die work of the Mint can be generally carried on by a second-class engraver, and outside artists called in when new matrices or medals are required.

In the Mint Office proper there was much that required to

be reorganised to meet the new arrangements that had been made for the provision of coin, and the duties of the different officers had to be reapportioned for the receipt, custody, and delivery of bullion and coin under the altered conditions.

The workmen, too, were not forgotten. Captain Harness says: "Their condition should be carefully provided for, their wages should be very good, their houses convenient and in good repair, a library should be provided for them, they should be entitled to pensions proportioned to their length of service, and after a certain period of service their widows and orphans should be entitled to pensions or gratuities. The principal inducements to dishonesty will thus be removed, and the strongest inducements to good conduct offered."

In the Assay Department, the Master's Assayer, as he was called, was paid partly by salary, partly by fees. "Under the present arrangement," Captain Harness writes, "the verification of the quality of the coins ought not to be dependent on a single Assayer . . . the Assayer on whose sole judgment without any official report of the exact result of his assay coin is issued for use, is the same person on whose assay the Bank, the only importer practically of gold bullion to the Mint, purchases the ingots. . . ." He proposed that "the department shall consist of one Resident Assay Master and one Assistant Assayer, and that three or four persons not belonging to the Mint should be appointed Assayers to the Mint, and be paid per assay when applied to." This has been partly carried out—fees for Government work are abolished, and the Assay Master is now a salaried Government officer, resident in the Mint. It may be pointed out, however, with regard to Captain Harness's reference to the double duties performed by the Assay Master, that in the Indian Mints where the amount of assay work at times of heavy coinage is enormous, bullion is bought entirely on the report of the Assay Master, and that the same officer furnishes reports on the meltings and on the finished coin,

and that no objection whatever has been found to the practice ; the value of the bullion is in most cases pretty accurately known before it is purchased, and mistakes of any kind are extremely rare. This is so at present in the Royal Mint : the Assay Master is a man of the highest scientific standing, and as far as is known there is now at no time necessity for recourse to any outside assayers. Up to 1870, however, these outside assayers were still employed to report on the bars melted ready for coinage, and on coins taken from the coined work, only the ingots when first imported being reported by the Resident Assayer ; but Sir C. Freemantle and Sir C. Rivers Wilson advised, in their Memoranda dated November, 1869, that all this work should be done within the Mint, and this reform was accordingly carried out.

Colonel Harness's Retirement from The Mint.

It is now necessary to refer to a subject which has only been incidentally mentioned, viz., the appointment of Sir John Herschel to the Mastership of the Mint, a few months after Captain Harness took up the work of Deputy ; Sir John, not being an official connected with the Treasury, or a mere nominal head of Mint affairs, as previous Masters were, became virtually the head executive. Captain Harness naturally resented this ; no man going over the record of the work of those times, can doubt that Captain Harness's strong grasp of first principles, his administrative capacity, the courtesy and fairness with which he dealt with all under his control, and his highly scientific mind, rendered him an officer peculiarly fitted for the work of reform to which he had been appointed. His first impulse was to resign, and he accordingly, in November 1850, wrote to Sir R. Shiel, the then Master, “. . . I believe it will be incompatible with my own honour to remain here. It is quite impossible that a Minister whose attention has been directed to the Mint with a view to its reform can intend to retain as working officers both a Master and a Deputy Master. To appoint

now a Master of the Mint as an executive officer is clearly to supersede me. I shall lose no time in consulting a brother officer, whose nice sense of honour has gained him the respect and esteem of his corps, that I may avoid the possible imputation of acting rashly or from temper." To this Sir R. Shiel replies: "I have had a great deal of experience in reference to office, and I venture to tell you in writing, what I have already expressed to you in conversation, that you will commit a *most signal* mistake in resigning. You have been appointed to an office of £1,000 a year with a residence. You have obtained what members of Parliament, after twenty years' service to their party, would be delighted to accept. Pardon me for adding that the step would be universally condemned. Remember that you have a family who have higher claims than you have upon *yourself*." This, however, was not sufficient for Captain Harness; thanking Sir Richard for his note, he said: "I have referred the question to a brother officer, by whom it will now be my duty to be guided, regardless of consequence. I think lightly of anything that can follow in comparison with the possibility of being lightly regarded by those whose opinions I value, and am sure that my children would fully understand and share these sentiments."

The brother officer, Sir William Reid, to whom he had referred for advice, replied: "I recommend you not to make any movements in consequence of Sir J. Herschel's appointment as Master of the Mint, but to keep your mind at ease. Your being appointed Deputy Master was a great compliment to you, and your office under Sir John Herschel is a high one. The appointment of such a man as Sir John is honourable to the Minister, and if you were to resign, you would be blamed for it, and thrown out of Civil employment. My earnest advice to you is to endeavour not to be annoyed, and to rest quiet and say nothing to anyone about it. You will work with a high-minded man, who will know how to appreciate your qualities, moral and scientific." Captain

Harness had, of course, felt this, for in his first letter to Sir William Reid, he said: "It is clear that my objection cannot be to the man under whom, under the circumstances, I should only be too happy to labour." Sir William Reid's letter, however, did not have at once his ready assent, for he wrote: "I cannot help thinking your kind feeling recoils from expressing an opinion which would be injurious to my interests. I feel that a line of conduct which is prompted by any fear of being blamed and thrown out of Civil employment is not as disinterested as it ought to be. . . . Do not fear to tell me anything you think I ought to do. There is no sacrifice that will not be light compared with the possibility of any thoroughly honourable man, on becoming acquainted with the facts, being able to say I did not act rightly."

Sir W. Reid, however, held to his opinion and added that the course he recommended was "the best for the public service, and on your part the highest line of conduct to follow."

From his immediate official superior in the Treasury—Sir C. Trevelyan, the recommendation has the same, though based on other grounds. Sir Charles writes: "There is one point of so much importance to a fair consideration of the subject which we discussed this morning with the Chancellor of the Exchequer that I feel it ought to be stated in writing, and the more so as it appeared to be new to you. This is, that Sir J. Herschel's appointment, if it takes place, *will not make any alteration in your official position*. This proposed appointment is founded on the recommendation of the Salaries' Committee, which is as follows: 'Your Committee recommend that this officer, as a Parliamentary officer, be abolished, and that the duties should be performed by a responsible officer under the direction of the Treasury.' The office to which it is proposed to appoint Sir J. Herschel is that of Master of the Mint, lately held by Mr. Sheil, the duties which he will have to perform will be the same as those which were entrusted to Mr. Sheil; and the only

difference will be that instead of being a Parliamentary officer, the Master of the Mint will be a permanent officer, possessed of scientific attainments of a high order. Allusion was made in the course of our discussion to the important assistance expected from you in carrying out the intended reform at the Mint. The assistance will still be expected from you, and you will even have to take a more active part than before, in so far as Sir J. Herschel, if he is appointed Master, will be new to the subject of those reforms with which Mr. Shiel had become well acquainted, both as member of Commission of the inquiry and as Master of the Mint. You are aware of the desire that was entertained at the Treasury that the Master of the Mint should undertake the direction of the changes in progress and should exercise the full responsibility of Master of the Mint; and as the knowledge of this did not prevent you executing the office of Deputy Master, greatly to the advantage of the public service under Mr. Shiel, I hope you will not, now that the facts are properly laid before you, take a different view of your position under Sir J. Herschel."

Captain Harness was greatly obliged to Sir Charles for his letter, and said: "I think it must very soon indeed be found that there is no occasion for two working men at the head of the Mint, and that Sir J. Herschel does not require a Deputy to perform his duties."

And Captain Harness was undoubtedly right; Sir John Herschel was practically the executive officer of the Mint until he resigned, and most of the work which had hitherto been performed by the Deputy alone passed into his hands.

Whether Sir Charles Trevelyan was quite correct in the reasons brought forward for Sir John's appointment it is difficult to say, but it may perhaps be suspected that the Government of the day, wishing to give the *imprimatur* of a great name to the reforms being then carried out at the Mint, thought they could not do better than appoint to the Mastership of the Mint a man of the highest scientific distinction.

This precedent was followed in the appointment of Professor Graham as Sir John's successor, but as there was no real necessity for two executive officers, the Deputy Master since 1869 has been the sole supreme executive at the Mint.

It is almost needless to add that as far as can be gathered from the correspondence Captain Harness worked most cordially with Sir John, rendering him all possible assistance ; but his duties had become irksome to him and feeling that his working powers were, to a certain degree, wasted in the changed position in which he now found himself, he wrote to Sir C. Trevelyan in May, 1852, that he was no longer fitted for employment within the Mint. He said : " The desire to be removed now that the reforms are sufficiently advanced to justify the expression of such a desire is so strong as to render it impossible for me to take that interest in the establishment which, if remaining in it, I ought to feel " : and in the October of the same year he again addressed Sir Charles, stating that there was no place for a Deputy Master ; that when Sir John Herschel was appointed he was virtually superseded ; that he had been specially charged on his appointment with the reforms of the establishment ; that the Government looked to him for their completion ; that on the termination of this duty his position had become most irksome and disagreeable ; and finally requested that he might be allowed to resign his situation, stating that he was ready at the same time to assist Sir John Herschel with his opinion on every point on which he might desire to consult him.

Sir C. Trevelyan, who had on a previous occasion written to Captain Harness that the object of his transfer " had been ably and successfully accomplished," informed Captain Harness personally : " That he had sent his note to the Chancellor of the Exchequer, and had since conversed with him on the subject ; that the Chancellor of the Exchequer fully understood the case, had expressed a great desire to keep him at home, and that if he waited patiently a few days

he would find himself employed on other duties, but retaining the Deputy Mastership of the Mint."

Matters, however, dragged on ; favoured by an interview with Mr. Gladstone, the then Chancellor of the Exchequer, in February, 1853, and nothing coming of it, he addressed him on the 9th of May to the effect that if the establishment did not object to his resignation of the office of Deputy Master, it was his wish to resign a situation in which it was impossible for him to be of further service. Mr. Gladstone replied to this : " If it is not disagreeable to you to retain your present office until the end of this month, I would beg you to do so ; and should nothing in the way of an opening by that time occur, I should not in that case offer any further obstacle to your resignation."

Before, however, this opening occurred, Captain Harness learnt, with painful surprise, from Sir John Herschel that Sir John's connection with the Mint was drawing to a close, and fearing that he himself might have in some way been the cause of this action on the part of Sir John, he wrote to him as follows : " I hope that nothing on my part has caused you to take the step you allude to. It has long been my own intention to retire from the Mint, if not removed to other duties, and my resignation is to be the subject of an official letter at the end of this month ; but I hoped to have effected all this without communicating my intention to you, and have now a painful feeling that the conduct which has appeared necessary for me to adopt may have become known to you and influenced you."

Sir John replied : " Pray do not for a moment suppose that I have found in your conduct anything to diminish that respect and regard which I feel, and ever shall feel, in relation to yourself. I was not aware of your having made any recent private communication such as you alluded to." On 30th May Sir John Herschel placed his resignation in the hands of Lord Aberdeen ; and on the same day Captain Harness wrote to the Lords of the Treasury, expressing his

wish to resign his situation as Deputy Master, and in the beginning of July was transferred to the Irish Board of Works.

The highly honourable and independent character of the man shines out through all his correspondence. From the time of Sir John's appointment he never ceased to give him his most active support, discussing the improvements generally of the Mint, the meeting of a heavy pressure of coinage, alteration in the vacuum coining presses, the separate weighing of minor coin, the drawing up of contracts for copper coinage, the arrangements for the establishment of a Mint in Australia, the position of the Bank of England as regards the Mint, and the numerous questions that must always occur in the reform of a large establishment; and that this was appreciated is seen from Sir John's letter at the close of May, just before his resignation, when he writes: "I think it only due to you, that having received such support and aid in the execution of my office at your hands as I have done, you should not learn the termination of our official connection after the event, and in a merely formal manner."

And Sir C. Wood also wrote to Captain Harness:—

"I have had a letter from Herschel to-day, in which he does full justice to what he calls the 'Lion's share' which you have had in the Mint reforms."

ESTABLISHMENT OF A MINT IN SYDNEY, AUSTRALIA.

During Captain Harness's connection with the Royal Mint, the establishment of a new Mint at Sydney, Australia, was determined on, Captain Ward, R.E., having been appointed its first Master. It may be of some interest, in order to explain Captain Harness's opinion on the question in which he took much trouble, to give a short preface explaining how matters stood in Australia before the Sydney Mint was constructed. In the Memorandum of Mr. Arbuthnot, the

Secretary of the Treasury, he states: "The discovery of gold in Australia produced a sudden and remarkable change in the internal trade of the Colonies immediately affected by it." The country had previously required only a very small circulating medium, but the concentration of numbers of people at the diggings gave rise to increased retail trade, and the want of money was immediately felt. "It was natural that with the means at hand in so great abundance for furnishing the material of money, a demand should arise for a mint at which it might be coined."

In the words of Sir John Herschel, to send good bullion "to England for coinage, and receive it back in specie (which is the process actually followed, though in a somewhat disguised form and which is the ultimate source of that depression of the exchange in London so loudly complained of), involves a double transport at a cost either way of 2½ per cent. for freight and insurance only, without reckoning interest for the interval elapsed; in other words, the present cost of coinage to Australia is £50,000 per million." Moreover, as the internal trade of Australia developed he considered specie would be required for its enterprises and speculations of every kind, and that Australia ought not to be dependent for them on another country distant by half the circuit of the globe.

The reason assigned for the establishment of a mint at Sydney by the New South Wales Legislative Council was the injurious effect of the state of exchange, occasioned by the large exportation of gold bullion, upon the producers of the staple commodities of the Colony. The same reason was put forward for the establishment of a mint at Melbourne by the Council of Victoria, who also pointed out the advantages possessed by Melbourne over Sydney for this purpose.

Lord Grey, Minister for the Colonies, expressed a doubt as to the expediency of the measure on account of the higher rate of wages in the Colony and the greater cost of working a mint there.

Captain Harness considered that the measure was imperatively necessary, on the grounds that a rising community like that of Australia with complicated mercantile transactions should not be dependent for its circulating medium on a mint at its Antipodes; and in this view he was in very close accord with Sir J. Herschel's views as given above.

The sound judgment and the close regard to future contingencies shown in this Memorandum are worthy of notice.

It appears probable that a single mint was quite sufficient to meet the wants of all Australia, no matter what the future demands for currency might be. Even in India, where distances are great and the coinages on a far larger scale (the standard being silver) than anywhere else in the world, it would be quite practicable to carry out the coinage at one single mint; but in Australia, where the coinage has to be gold with a comparatively small amount of subsidiary silver, and where the distance between the two gold-producing countries was only six hundred miles, there seemed to be no necessity for incurring the "unnecessary expense and possible inconvenience" of two establishments. Sydney was finally selected as the site of the single mint, probably on account of New South Wales having been the first to provide the necessary funds.

As to the subsidiary silver coinage, there certainly would have been a risk, as pointed out in Captain Harness's Memorandum, if two mints had been established, of the silver coins of one province being refused by the other; there is a profit to the State when such coinage is issued at a "considerable seigniorage," and there might have been temptation to over-issue in times of impecuniosity, especially if silver became cheap.

The copper coinage, Captain Harness thought, might be more economically procured from England. It is believed that the Burra Burra Mines had not then been discovered, but even if they had been, such heavy plant is required for the rolling down of copper cakes and the risk of the breakage of

machinery are so great, it was probably the best plan, as he recommended, to procure such coin in England rather than to manufacture the copper on the spot.

As regards the amount of coinage, Captain Harness advised that to prevent unnecessary coinage, bullion should be sold at the Mint at a price which would generally cause it to be preferred for exportation. It is a moot point, however, whether any such checks as these are required; as a rule, bullion is not brought to a mint unless the coin is wanted, and it is better, perhaps, to let the currency of a country adjust itself naturally according to the demands of commerce, buying the bullion at a rate which will just cover the cost of coinage, than to regulate the amount by State enactments.

The Mint was finally established and brought into full working by Captain Ward, R.E., not the least of his difficulties being the discovery that the copper with which they were supplied was brittle and unfit for coinage. In this place it is only necessary to say that these difficulties were all surmounted, and that the Australian Mint has, since its first establishment, carried out its coinage satisfactorily, and that the pyxes which are yearly forwarded to the Royal Mint for trial have shown that the gold coin has been always up to the standard, within the limits prescribed by law.

It may be interesting to add that in 1853 Captain Ward's report on the progress of his work at Sydney was forwarded to Sir John Herschel and was commented on by Captain Harness. On this occasion Sir John wrote to Captain Harness: "I have read and weighed most carefully the letter you have drawn up to accompany the transmission of Captain Ward's report. It is everything that could be wished, and is throughout characterised by that admirably methodical and lucid arrangement and comprehensiveness which distinguishes everything you take in hand, and makes it possible to refer every subordinate detail to its proper place in the general system."

Discussion on Currency, 1852.

In February, 1868, a Royal Commission was appointed on the question of International coinage, and in the course of their report they enumerate the measures which appeared to them essential to any scheme of International coinage, and the change that would be required in the practice of this country in the event of England proposing to take part in its establishment, viz., the imposition of a mint charge to cover the cost of manufacturing the coin.

This question of a mint charge, and of the existing bank charge of 1½d. per ounce for handing coin to the tenderer of bullion immediately on its delivery, had happened to engage the attention of Sir J. Herschel, Mr. Arbuthnot, and Captain Harness some years previously. In 1852 Sir John wrote to the Treasury on the subject of the heavy demand for gold coin, which was greater than was necessary to meet the legitimate requirements of Great Britain and its Colonies; he pointed out that, the profit to the Bank of England being large on the passage of gold through the Mint for coinage, was an obvious inducement to their encouraging it; and also that the precision of our coinage and the standard of the metal being higher than that of France, Belgium, the United States, etc., led to the exporting merchant preferring coin to bullion for sending abroad; and suggested that the imposition of a small "seigniorage" would strike at the root of the practice of exporting coin for purposes which simple bullion could equally well perform, raising at the same time the question as to whether the bank charge of 1½d. per oz. did not already constitute such a "seigniorage."

These points were discussed at length by Sir John and Mr. Arbuthnot, and were taken up by Captain Harness in his Memorandum of May and June, 1852, and as they bore closely on the proposal for International coinage, the papers are given at length in the Appendix to the Report of the Royal Commission.

The first Memorandum was as follows :—

Memorandum by Captain Harness, when Deputy Master of the Mint (extracted from Report of the Royal Commission on International Coinage, 1868).

May, 1852.

“ In a country of which gold is the sole standard of value, its own gold coin the only legal tender, its mint free, and no delay whatever (assuming this to be practicable) attending the conversion of bullion into coin; nor any circumstances whatever existing to cause a preference to be given to either coin or bullion for remittances to foreign countries—no difference of price could exist between bullion and coin, and the standard of value in that country would remain as uniform as a standard dependent on a single commodity, and that commodity gold, could be rendered.

But if there were any circumstances whatever tending to create a difference in value between bullion and coin, such as either a direct mint charge, a delay in the conversion of bullion into coin, arbitrary rules in the practice of the assayers or in the customs of the bullion market, advantages or disadvantages attached to coin in comparison with bullion for foreign remittances—then the nominal price of bullion, or the relative values of coin and bullion, might be liable to fluctuation, and the standard of value of that country might vary to an extent dependent on the possible effects of those disturbing causes.

It would be useless to attempt to trace all the combinations of circumstances of the description referred to that could occur; it is only necessary to consider those which may best assist the present inquiry.

Suppose the only causes affecting the market price of bullion to be a trifling delay at the Mint, and an advantage possessed by bullion of average fineness over coin in some foreign market. When gold was not required for export to that market, and there was no probability that it would soon be required for that purpose, the Mint delay would be the circumstance principally affecting the price of bullion, which would remain nearly at the value of an equal quantity of gold in coin, less the interest for the period of delay: but when gold was required for export to the foreign market alluded to, bullion would become more valuable than its coined equivalent, by an amount equal to the advantage it might possess in that market. In this case, in spite of

what might be termed a free mint, the standard of value would be liable to fluctuation.

Next, suppose that there is a small charge for coinage at the Mint, but that the advantage possessed by the coin over bullion for export exceeds the expense of conversion. In this case it is clear that all bullion would be coined, and that the relative prices of coin and bullion would remain the same in all states of the exchanges; the cost of conversion alone determining the difference, and this country, with a mint charge, would not have its standard of value affected by the two disturbing causes under consideration.

If the cost of converting bullion into coin were exactly equal to the advantage of coin for exportation, the relative prices would be equally uniform; but there would no longer be any inducement during an unfavourable exchange to convert bullion into coin previously to exportation.

If the cost of conversion exceeded the advantage possessed by the coin in the foreign market, the relative prices would be liable to change, and the standard of value to fluctuation, from this cause; during a continuance of favourable exchanges the expense of coinage would principally determine the price of bullion; but when the exchanges were unfavourable, the relative values of coin and bullion in the foreign market would determine it.

It appears, then, that the relative prices of bullion and coin, and consequently the standard of value, might be liable to or free from fluctuation, whether there be or be not a mint charge; but that a mint charge may cause such fluctuation, when imposed without reference to all the circumstances affecting the particular currency; and its omission may be the cause of great unnecessary expense to the community for coinage.

It should next be seen how the existence of banks of issue may affect the question.

First, suppose that there is no mint charge, but that the time occupied by the Mint in coining would, in the case of a very extraordinary demand, be varied with the extent of such demand, and that this delay is the only circumstance affecting the relative prices of coin and bullion.

When bullion was flowing into the country in consequence of a favourable exchange, the receivers of it would always find ready purchasers in the banks at its equivalent in coin, less the interest for the period of

detention at the Mint. Bullion in the Mint would be the best description of banking security; the application of his available deposits to its purchase would be the same to a banker as discounting an indisputable safe bill, for the same value, for the period of the Mint detention; but if the flow of bullion to the country were extraordinarily great, the Mint would increase the period of detention, and thereby cause an alteration in the price at which the bankers would purchase it, or a fall in the value of bullion relatively with coin.

If the circulation consisted partly of notes issued by the different banks without any guarantee or privilege on the part of the Government, the bankers would use their notes to the extent to which they could obtain a circulation, in the same way as their deposits in the purchase of bullion and other banking securities: but they would have no claim to any extraordinary exertions of the Mint in their behalf; and if in want of coin sooner than under the working rules of that establishment they could obtain it, they would cease to purchase bullion, and would part with such as they might possess, either in or out of the Mint, at the proper market price at the time, just as they would with any transferable securities which they might hold under similar circumstances.

But if either of the banks issued its notes under the guarantee of the Government of the country, that bank could make, by urging the consequences of a failure in its coin, a powerful claim upon the Mint for extraordinary and even unreasonable exertions for the coinage of the bullion held by it; and the certainty of all its demands for coinage being attended to on this account, would enable it to offer the highest price for bullion, and thereby obtain the monopoly of the bullion market, and to refuse to part with bullion except for the full profit which it could realise upon it through the Mint. If coin were more valuable than bullion for exportation, the interest of this bank would increase the unnecessary consumption of coin which that circumstance is likely to produce; for retaining the monopoly of the bullion market, and never parting with it but at the price of coin, the latter would invariably be preferred for exportation.

The existence, then, of a bank of which the notes are guaranteed by the Government has a tendency to extend the limits within which the relative prices of coin and bullion can fluctuate, and also to expose the community to unnecessary expenditure for coinage. The only

remedy for the latter evil appears to be to require such payment for coinage as will make it the interest of the privileged bank to sell bullion at a less price than coin ; and if the charge be just equal to the advantages which coin possesses over bullion in foreign markets, the fluctuation in the relative prices of coin and bullion might also be diminished by its imposition."

Mr. Arbuthnot replied to this at length ; he contended that when there was a demand on the Continent for gold for coinage it was generally exported in the shape of bar gold, and that no inducement existed for the export of sovereigns except when they were wanted primarily for the purpose of coin ; he demurred to the assumption of the bank charge of 1½d. per oz. being considered to constitute a " seigniorage ;" he pointed out that this charge was a legitimate profit of the Bank on the bullion passing through their hands, and that the fixed price given by the Bank of £3 17s. 9d. per oz. of bullion had merely the effect of giving certainty to the ultimate return on bullion transactions ; he considered that any mint charge which would check the exportation of coin would interfere with the integrity of our system of currency, and that the advantages of a free Mint were considerable, as compared to the minor evil of the Mint being subjected to the expense of coining gold whose ultimate destination might be the melting-pot of the jeweller or foreign mints. As to Captain Harness's question of mint notes differing in no respect from Bank notes, he considered that Captain Harness was not correct in his position, as the Bank of England notes, not only like the mint notes, guarantee the payment of so much coin on demand, but are securities for the return of the bullion in the shape of bar gold should it be required.

To this, Captain Harness rejoined in his second Memorandum of June, 1852 :—

Captain Harness's Reply.

June 4th, 1852.

" The first page of your letter of May 28th appears to me to conclude the subject under discussion.

It was stated that the regulations under which gold is bought and sold in this country have a tendency to make coin a preferable export to bullion, and perhaps even to divert gold in its progress of distribution through this country, and to cause it to be uselessly coined here.

The two returns you have obtained show that the result, which it was supposed these regulations must produce, has been produced ; and it appears unnecessary to look for any other cause when that alluded to is so evidently sufficient that the result was considered a necessary consequence before the facts were ascertained.

I do not say that the Bank either have or have not adopted any steps to divert gold through this country, for the sake of the profit likely to be derived by them on all gold passing through it ; but the large amount of profit to be thus derived at the present time, in consequence of the large amount of gold now distributing over the world, may induce them to take such steps, and may probably have already induced them to do so.

I think the Bank have an inducement to encourage the exportation of coin instead of bar gold, for they derive a greater profit from the coinage of bullion than from its sale.

Under the present constitution of the Bank of England there appears to me to be very little difference between their charge of 1½d. per oz. on bullion and a mint charge ; or between their notes in excess of their fixed issue, or issued against gold and mint notes. In fact, the duties of the Issue Department might probably be advantageously performed by the Mint, though the union of the Mint with the Banking Department of the Bank of England would be a very dangerous measure. If a mercantile establishment, not being issuers of notes, made the purchase of gold bullion a part of their regular transactions, they would of course include, in calculating the price they could afford to give, interest on the same to be paid for the bullion for the period required for converting it into coin. This period would vary with the extent of the demands upon the Mint ; and the price of bullion in an open market would accordingly vary with the demands upon the Mint and also with the rate of interest at the time for the best description of securities. For ordinary bankers, whether issuers or not issuers of notes, the purchase of bullion would be the same thing as discounting a first-rate commercial bill for the same period as that required for converting the bullion into coin ; but in the event of an unexpected

drain upon their deposits, they would part with their bullion as with other securities, at the proper market price at the time, to meet the demands upon them, having no claim upon the Mint to deviate from its rules for their advantage. But the notes of the Bank of England being issued under regulations made by the Legislature, and being a legal tender in payment of the notes of other banks, enable that establishment to say: "We will not part with gold bullion except at a price at which coin will be preferred. However great the pressure upon us for gold may be, we will not sacrifice the profit to be derived by us from its coinage; the Government are responsible for the convertibility of our notes, and we can transfer the pressure upon us to the Mint."

Under the existing circumstances, the purchase of gold bullion by the Bank of England only differs in character by the profit they derive from it from receiving the same amount of sovereigns in exchange for notes. In neither case is the reserve of the Banking Department diminished by the transaction. The charge of 1½d. per oz. is not then an allowance for loss of interest. With all other mercantile firms, including other banks of issue, of which the amount of issue (as with all other English banks) is limited, interest would be a legitimate charge, but with the Bank of England it is an admitted premium on exchanging current money for gold bullion; and except that it is received by different persons, and is not available for the expense of conversion, I do not see in what respect it differs from a mint charge. If the Issue Department of the Bank were united to the Mint, the notes issued by the Mint in exchange for bullion brought to it would be mint notes; and the difference between the quantity of standard gold represented by them and that delivered to the Mint would be called a mint charge. Now, this operation would be the same as that performed by the Bank of England in purchasing bullion. The large profits derived by the Bank previous to 1844 from the purchase of bullion may, perhaps, be considered practically of the same character; and one advantage of the Act of 1844 is, that it diminished the fluctuations in the value of bullion; but by that Act the unrepresented paper circulation of the country has been limited, making an important difference in the theoretical consideration of the question. It is only necessary to consider it as it now exists.

Your arguments on the question of "seigniorage"

appear to me inapplicable to such a "seigniorage" as would be required to meet the evil under discussion. It is admitted that a "seigniorage" (if high in comparison with the fluctuations to which the value of the currency of a country would be liable if there were no such "seigniorage") increases the range within which such fluctuations of value may occur; and that if the currency consists partly of an ill-regulated paper circulation, these fluctuations may be more frequent and sudden than they would otherwise be.

But in a country with a free mint and a metallic currency, or with a currency in which the amount of the circulating paper unrepresented by gold is strictly limited (as with us), the value of the currency is liable to certain fluctuations; and under some circumstances the imposition of a small "seigniorage" has no tendency whatever to increase the amount of such fluctuations.

The reasons for preferring that one of the precious metals, if a single commodity be adopted as the standard of value, are applicable to them as bullion, not as coin; and fluctuations in the price of the bullion must therefore be considered as fluctuations in the value of the currency. In proportion as the difference in value of bullion and coin continues uniform, may the currency of a country be considered uniform in its value, so far as the standard selected will permit.

If the Mint were perfectly free, if there were no delay whatever attending the conversion of bullion into coin, and if coin and bullion were equally advantageous for exportation, there would be no reason why any difference in price should at any time exist between them. But even with a free mint there may be delay in the conversion, there may be arbitrary rules observed by the assayers, and either coin or bullion may have some advantage with respect to each other, for exportation. During an influx of bullion, the expected delay of the Mint, combined with the rules observed by the assayers, would determine the relative value of bullion and coin. During an efflux of the precious metal, the relative advantage of coin and bullion for export would determine their relative value. The difference between the prices of bullion at those two periods would measure the fluctuation in the value of the currency. If the price to be obtained for bullion during its influx were £3 17s. 9d., and that during its efflux £3 17s. 10½d. per oz., the currency might be considered to vary in value between those two periods by nearly one sixth per cent.

Suppose the only circumstance affecting the price of bullion to be a small charge for coinage, and an advantage rather exceeding the above charge, attending the exportation of coin instead of bullion. In this case it is nearly certain that all bullion would be coined, and that the relative prices of coin and bullion would remain the same in all states of the exchanges, the mint charge producing no fluctuation in the value of the currency.

It is hardly necessary to pursue the general question further. If there be advantages attending the present state of things, which can more than counterbalance the expense to which the country is like to be exposed, and also the possibility of such an event as an insufficiency of coined gold to meet the demands upon the Bank, of course alteration is unnecessary.

But may we not attach too much importance to the idea that this country will become the great emporium for gold? Would it not be better that it should be a great emporium for those important commodities for which we are dependent on other countries; and to exchange for which the gold is only valuable; and which in time of need we might find it difficult to obtain with our gold? May we not also attach too much importance to the general use of our coins abroad? Those of Spain formed the only currency of our West Indian Islands twenty-five years ago, yet the Spanish merchants derived no advantage from that circumstance. Is it certain that its dissemination in the shape of British coin will in any degree advance its use as a medium of exchange, and thereby check disturbance of prices? Will it not flow into the currencies of other countries without any assistance of this kind as soon as it is advantageous in those countries to use it? As a nation owing a debt of gold, we have, moreover, much to gain from the depreciation of gold."

Mr. Arbuthnot's Reply.

June 5th, 1852.

"I have received your letter of the 4th. I will make but one observation in reply to it.

A capital error pervades your whole argument. It is contained in the following sentence of your letter:—

"(In the case of ordinary bankers.) In the event of an unexpected drain upon their deposits they would part with their bullion as with other securities at the proper

market price at the time, to meet the demands upon them, having no claim upon the Mint to deviate from its rules for their advantage. But the notes of the Bank of England being issued under regulations made by the Legislature, and being a legal tender in payment of the notes of other banks, enable that establishment to say: we will not part with gold bullion except at a price at which coin will be preferred; however great the pressure upon us for gold may be, we will not sacrifice the profit to be derived by us from its coinage; the Government are responsible for the convertibility of our notes, and we can transfer the pressure upon us to the Mint.

I pass by that part of your supposed case which is founded on the mistaken assumption that ordinary bankers are traders in bullion, also the remark put into the mouth of the Bank, "We will not part with gold bullion except at a price at which coin will be preferred," which begs the whole question; also the subsequent remark, "The Government are responsible for the convertibility of our notes," which is only in a partial sense correct, and with reference to which I may refer you to Sir C. Wood's speech in 1847 on "Commercial Distress" with regard to the responsibility of the Bank in the management of their reserve.

I will take the sentence in its obvious meaning, that if the notes of the Bank of England were not (to a certain extent, as I admit, they are) guaranteed by the Government, they would part with their bullion at a lower rate than the Mint price in times of pressure, in order to meet the demands upon them.

Now, apart from *runs* arising from distrust in the stability of the Bank, to which, I apprehend, you do not refer, "drains upon deposits" arise when the foreign exchanges are unfavourable to us and our dealers have difficulty in meeting their engagements. On such occasions the price of gold is higher in foreign countries than the price which it bears in the circulation of this country; it is then profitable to purchase bullion at the Mint price at £3 17s. 10½d. per oz., and after incurring the expenses of transport, etc., to sell it in a foreign country.

Yet you suppose that it might be necessary for the Bank of England (if its notes were not guaranteed), when there was a demand upon them for bullion at the Mint price, to sell it at a still lower price, and thus stimulate the drain. You imagine a state of things which could by no possibility occur."

*Captain Harness's Reply.**June 7th, 1852.*

"The construction you have given (as the obvious one) to the paragraph to which you have replied is quite correct, but I feel sure that very soon after despatching that reply you must have perceived that my letter contains no such error as you supposed when writing. If it were more advantageous to export coin than bullion by $\frac{1}{4}$ d. per oz., and both coin and bullion were being sold at £3 17s. 10 $\frac{1}{4}$ d. per oz., when the exchange was at such a state as just to move the coin, it would not move the bullion; and if the price of the bullion were then reduced to £3 17s. 10 $\frac{1}{4}$ d. per oz., the drain of gold would not be stimulated, but an exporter would have no reason to prefer coin to bullion. I think you will find this meaning clearly expressed by my letter."

*Further Reply of Captain Harness to Mr. Arbuthnot.**June 10th, 1852.*

"I am sorry to find that you cannot adopt my views of the subject we have so long discussed. I do not doubt that it would not answer the purposes of the Bank under existing circumstances to sell bullion for less than the mint price; and before speaking of bullion as a banking security, I showed that it might be looked upon in the same light as the best descriptions of securities for the employment of bankers' deposits under the circumstances assumed by me.

I wish we could have met at the Mint before I left town. Perhaps we should then have agreed upon the necessity for a mint charge of one-eighth per cent. It should be now imposed by a compromise with the Bank, the country paying the Corporation a fixed annual sum for the remaining time of their charter for the right to impose it on their gold, as it would be in spirit certainly an infraction of the conditions of their charter."

There the discussion closed. The Royal Commission, in their report, remarked that it was no part of their duty to express an opinion on this question of levying a charge for mintage generally, but that it was obvious that if coin current in several countries were struck at different Mints at varying charges for coinage, a very large and unnecessary expense would be thrown on those Mints where there was the least charge.

J. H. W.

CHAPTER IV.

BOARD OF PUBLIC WORKS, IRELAND,
1854-55.

BY LIEUTENANT-GENERAL SIR R. H. SANKEY,
K.C.B., R.E.

*Memorandum on General Harness' Service as Commissioner,
Board of Works, Ireland (chiefly supplied by Mr. W. B.
Soady, late Secretary to the Board).*

By a Treasury minute of 5th August, 1853, confirmed by Royal Warrant of 16th idem, Richard Griffith, Captain Harness, R.E., and John Radcliff, were appointed Commissioners of Public Works in Ireland. In this position Harness performed *inter alia* many of the duties devolving upon the Board in connection with schemes of *Arterial Drainage*, then a heavy service, in pursuance of the *Act 5 and 6 Victoria, cap. 89, etc., etc.*

This Act, unlike that of 1863, under which all initiative and responsibility for execution is thrown on the locally interested landed proprietors, imposed nearly all these duties on the Board of Works, thus enhancing immensely the responsibility of the Commissioners, who were not only charged with the preparation of all plans and estimates

for the works, but for their execution and the preparation of the final award under which the estates of the interested landlords were well charged.

A great impetus was given to the prosecution of works of this character, owing to the necessity for finding employment for the labouring poor during the great Famine of 1846-47. Though the Commissioners were empowered under existing enactments to expend on works up to £3 per acre, they had no power to exceed this limit without the assent of the interested landlords.

Unfortunately, from the inefficiency, and the resulting enhanced cost of famine labour, hardly any of the arterial drainage works commenced at the period could be completed within this legal limit of charge, with the result that the landlords refused to assent to their continuance.

Legislative means were subsequently found for completion of the several works, but owing to the delay necessary in obtaining the needful enactment, the cost of all the work was still further enhanced by accrued interest in the sums advanced by the Board of Works.

To remedy this state of matters, a special Commission of Inquiry, consisting of the three Commissioners of the Board of Works, was appointed under a recommendation of the House of Lords in 1851. This Committee had, in pursuance of this duty, to hold inquiries and take evidence as regarded all the circumstances connected with the execution of works in 121 drainage districts, with an aggregate of 336,000 acres, involving the interests of 3,100 separate landed proprietors, and also three large navigation works :—

- (1) Lough Neagh and Lower Bann ;
- (2) Ballinamore and Ballyconnell Canal ;
- (3) Loughs Corrib Mask and Carra ;

on which the charges to counties were to be similarly dealt with. In each separate case they had to determine, after hearing all the evidence on the spot, what abatement on the actual cost should be made, so that the owners of the lands

should not be charged with anything in excess of the proved benefits as derived from the drainage operations; or, the ratepayers in navigation districts, in excess of the ascertained value of the facilities afforded by the works executed by the Board.

The total outlay on the works amounted to £2,390,612, and relief given to the landlords amounted to £1,207,582.

The work of this Special Committee did not terminate till 1859, Captain (now Colonel) Sir John McKerlie taking Harness's place on the Board in 1855; but, on the latter, for about two years, apparently devolved much of the settlement of principles and procedure in giving effect to the objects of the Inquiry.

Throughout this difficult and responsible service, calling for judgment, tact, and skill, Harness showed the same qualities as in respect to all the other multifarious duties devolving on the Board of Works at this period.

These latter were of no light or perfunctory character, many of them being, in fact, of hardly less importance than those already adverted to. Among others the Shannon works, which had been in hand for sixteen or seventeen years, were not quite completed. The same may be said of the fishery piers and harbours, demands for which under the various Acts of Parliament had been constant since the formation of the Board of Works in 1831; to say nothing of the ordinary charge of the five Royal harbours in Ireland and Ireland Navigations.

The Board's Loan Services, which at that time included the control of at least three commercial harbours (those of Limerick, Galway, and Drogheda), must also have called for much of Harness's attention.

On the 3rd August, 1854, Major Harness was nominated in succession to Captain Laffan, R.E., as auditor of the accounts of the Midland Great Western Railway; chiefly in reference to that portion of the system between Athlone and Galway, for the construction of which an advance had been made of

£500,000 by the Loan Commissioners of England. He had to see that no portion of the net receipts in any half-year were appropriated for the benefit of the shareholders of the rest of the system ; but the duties do not appear to have been very onerous.

Memoranda as to procedure under the Commissioners of Public Works, Ireland, by Mr. Manning, C.E., of the Irish Board of Public Works. An "incomplete tribute to the memory of Captain Harness, from an old officer who served under him more than forty years ago."—6th March, 1897.

The Act above quoted having been passed, applications were made to the Board of Works by the proprietors of lands subject to floods from the rivers or drains running through them. The Board then employed a civil engineer to make plans for the drainage, and a valuator to ascertain the value of the lands (in their then state), and to give an estimate of the value of their improvement to be effected by the execution of the proposed works. A report upon the whole scheme was then published and distributed ; a public meeting was held ; and if the assents of the proprietors of two-thirds of the acreage of the land were given, the works were proceeded with under directions of the Commissioners by officers appointed by them. All requirements of the Act having been complied with, and the works completed, a final award was made and published.

A body of Trustees was then appointed to whom the future charge of the maintenance of the works was handed over.

In the last three columns of the award are given : "The proportion in which the lands shall in future be charged for the maintenance of the works" ; "The amount of each half-yearly repayment of the cost of the works in respect of the lands charged" ; and "The rate to be expended by the Trustees for the first year's maintenance of the works."

The following is a copy of a minute of the late General Harness, R.E.—one of the Commissioners—(dated 3rd February, 1854) giving the decision of the Board on the principles to be adopted in fixing the increased rent in cases of lands held by leaseholders under "the Proprietors," as authorised by the Drainage Acts ; and also a draft memorandum obviously written for his own guidance. It may be observed that the decision of the Board in such cases does not directly affect the proprietors, but is in the nature of compensation to them (in the form of increased rent) for

payment of an improvement from which they cannot receive any advantage during the existence of the leases. General Harness was the Commissioner in charge of the Drainage service, and gave the greatest attention to all subjects connected therewith, to the great advantage of the proprietors, as well as performing the public duties of his office.

*Extract from the Board's Minutes, 10th February, 1854.
First Volume of Increased Rent Records.*

(Copy.) The Board having considered the principle on which the increased rents are calculated, when applications to fix such increase are made to the Board under the provisions of the Drainage Acts, are of opinion that in future the following principle of calculation should be adopted—whenever the statements in the final award upon the district are not disputed—the whole improvement is immediately available—and the duration of the lease not greater than forty years, viz. :—That such increase be computed at five per cent. on so much of the principal sum charged in the award as may be considered to be charged on the land for which the additional rent is to be fixed, and by adding to this result the estimated cost of maintenance. In which case the result will be independent of the length of the lease.

And if the probable duration of the lease be greater than forty years then the increased rent should be the annuity for its probable duration, of which the present value is equivalent (at four per cent. interest) to that portion of the principal sum charged in the award, considered to be charged on the land for which the additional rent is to be fixed : and by adding to this result the estimated cost of maintenance.

(Signed) H. D. H.

3rd February, 1854.

From Sir C. Trevelyan relating to Drainage.

DEAR HARNES,

Before we act upon this letter, I should be glad to know the grounds of the opinion that the combined works of drainage and navigation differ from the drainage works :—

(1) In its being necessary that the whole of the navigation works should be completed before the award is made ; and

(2) In there being no power to appoint Trustees

for arterial drainage works when combined with navigation.

The legislation relating to the arterial drainages was intended throughout to apply equally to the combined works of drainage and navigation; and these works were accordingly expressly included in the instructions to your Commission, making the final reference of the works to be reported upon by you under the recent Act of Parliament.

Yours sincerely,

C. TREVELYAN.

Treasury, 26th May, 1855.

From Lieut.-Colonel Harness to Sir C. Trevelyan.

Dublin, 29th May, 1855.

MY DEAR SIR CHARLES,

The two points on which you desire information may, I think, be easily made clear to you. First, the proportion in which the different townlands within the district assumed to be benefited are to contribute towards each navigation work are set forth in a declaration; and there is no power to make an award in which those proportions differ from the declaration—yet they would be inapplicable to the case of a portion if the navigation scheme were abandoned. This is the difficulty to be dealt with in the Lough Corrib case. It cannot, I think, apply equally to an alteration of depth, such as we contemplate in the Ballinamore-Ballyconnell (navigation canal); but the solicitor fears that the powers of the Acts have been exceeded in undertaking the western portion of the works at all, as from the summit to the Shannon the navigation is not obtained by the improvement of a river, nor is it in connection with drainage.

With respect to the second point, you will see that the 120th section of the 5th and 6th Victoria, c. 89, under which trustees are appointed, except those cases in which a navigation has been improved or formed. There is nothing in the later Acts to alter this, and it has evidently been always contemplated here that the districts containing navigation works would remain permanently in the charge of the Board of Works.

There is no doubt these districts are referred to us to be reported upon, and any recommendation we may make with respect to alterations of the drainage portions of the works, or remissions of charges on the pro-

prietors of the lands, would be as valid as for the other districts ; but there is nothing in the 16th and 17th Victoria (c. 130) (which authorises these alterations and remissions) that will enable the subdivision of the charge for the navigation to be made differently from the schedule in the declarations ; and the solicitor is very decided in his opinion that the Act does not apply, and that when drawn it was not intended to apply to this.

(Signed) H. D. H.

From Lieut.-Colonel Harness to Sir C. Trevelyan.

Dublin, 14th June, 1855.

MY DEAR SIR CHARLES,

I have now before me your letter of the 12th inst., with respect to the Slob at Youghal, and feel so strong an objection to the course therein directed, of having another valuation made, as to think it not improper to write to you about it.

I find that valuers can express opinions differing enormously, and my distrust of their honesty has become very great indeed.

It appears to me that nearly all are ready to adopt the views that may be suggested to them by those they wish to please, and a very low valuation would increase our difficulties.

In dealing with the case up to the present we have thought it impossible to recommend any charge less than the original estimate. In districts where there are many proprietors, some of whom were not assenting to the works, a charge disproportioned to the improvement effected would be a very great injustice to the proprietors who had disapproved of their commencement, and in extended districts it might have been difficult for the proprietors to form a judgment of the value of the whole of the intended improvement ; and on that account it would be unjust, even where they were all assenting parties, to limit our recommendations too closely to the estimates assented to. But neither of these cases corresponds with the Youghal Slob. The operation was limited to the reclamation of 220 acres of land from the sea ; this land is the property of one owner only, and that person an English nobleman of the highest rank. His advice with respect to the quality of the land proposed to be reclaimed must have been at least as good as that on which the Board of Works undertook to enclose it.

He asked for the work to be undertaken ; when reported upon he assented to it ; and when the works were in

progress, and about £600 had been spent, he assented to their continuance. All works of this description exposed to the sea and storms are liable to risks, and this work had to be carried on under the usual difficulties. The expenditure is seen thereby to be double the original estimate; the proprietor has been saved the heavy annual expense of maintaining a new embankment by its being retained by the Board of Works for so many years; and he has been exempted from making any payment until the land has been so long embanked that it is ready for cultivation.

Under all the circumstances above stated, if it were worthless the proprietor should be held to be equitably indebted to the public by at least the amount of the estimate.

But all the valuers agree that the land is excellent, and after inquiries made by us at Youghal with respect to land there, I believe that we ought not to assume that it can be worth less than £3 per acre, which is the rate at which it was valued in the original report of the Engineers, who inserted that value (I believe) on the suggestion of the Duke's agent.

(Here follow some uncomplimentary remarks about the Duke of Devonshire which it would not be desirable to reproduce.)

It is unpleasant to feel that the valuations on which our recommendations are made are not accepted with confidence; I do not believe they are even too high, for the natural bias of the valuers under present circumstances is likely to prevent any tendency in that direction, but by some recent cases there is a tendency to drop these to a scale that we cannot believe it would be just to the public to permit. If the Treasury think a re-valuation of the Youghal Slob desirable, it is also desirable that a valuer of the highest character in every sense should be sent from England for that purpose—Mr. Griffith suggests Mr. Classon.

(Letter apparently ends here.)

Explanatory Memoranda on the two preceding Letters by Mr. W. B. Soady, of the Board of Public Works, Ireland, dated 5th March, 1897.

The latter part of Sir Charles Trevelyan's letter of 26th May, 1855, apparently refers to the Act 16 and 17 Victoria, c. 130, which was passed to enable the Treasury to make certain remissions on drainage loans, and which he thought would

enable them to make similar remissions for the navigation works. Colonel Harness points out that this cannot be done, and enters generally into the subject of these works.

The Act 18 and 19 Victoria, c. 110, was in consequence passed to—(1) enable the Board to apply funds for the completion of the navigation works; (2) to curtail the works and, of course, to reduce the charge against the counties; (3) to make awards, the incomplete works notwithstanding, to recover reduced charges from counties; (4) to transfer works to counties for maintenance: the original Acts having provided that they should remain in the hands of the Board for that purpose.

It will be seen that Colonel Harness, in the above referred to document, suggests these points, and no doubt enlarged upon them when the draft Bill was before him.

A subsequent Act, 19 and 20 Victoria, c. 62, was required to give more detailed powers, but before this could be done information had to be obtained and arrangements made which were not available in 1855. How far he could have had a helping hand in this last Act I cannot say.

He strongly takes up the point that the counties cannot possibly be charged beyond the moiety of the original estimates as set forth in the declarations; and further, that even this cannot be maintained when a portion of the navigation scheme was abandoned.

This, together with the tabular statement of the drainage and navigation works in connection therewith, gives all the information I can obtain in the papers detailed above.

Re the Youghal Slob Reclamation.

Referred to in letter to Sir Charles Trevelyan of the 14th June, 1855, and the action taken in respect thereof by the proprietors appears to me to warrant the just indignation therein expected.

The reclamation from the sea of 224 acres of good land, valued before the work was commenced and after its completion to be worth £3 per acre per annum. The original estimate was £8,812; the expenditure on it amounted to £22,890, partly due to the retention of the work for several years by the Board, after its completion, as explained in Colonel Harness's letter.

The Duke of Devonshire assented to the estimate of £8,812 on the understanding that the work would be handed over to him immediately on its completion. This sum, and whatever was expended on it by the Board in subsequent maintenance, therefore ought to have been admitted as properly chargeable against the Duke. I cannot now say why the work was held by the Board so long, or what were

the grounds on which the Duke refused this reasonable settlement, but whatever they were Colonel Harness could not fall in with them.

The annual value of the land, £672, would have paid off £10,300 in twenty-two years, including interest at $3\frac{1}{2}$ per cent.

Or £13,400 in thirty-five years at the same rate of interest.

The purchase-money of £672 at twenty-five years' purchase amounts to £16,800, which, if the valuation was a true one, would be the true value or near it.

The amount actually charged and paid by them was £7,000 only.

I can only assume that the Duke's agent, knowing that remissions were given freely, thought that he also might get some of the spoil for his master.

Abolition of Turnpikes, Ireland, in 1854. Note by Mr. Soady.

Her Majesty the Queen, on the 13th June, 1854, issued a Commission to certain persons to inquire into and report upon the propriety of maintaining or abolishing certain Turnpike Trust Roads leading from the City of Dublin to places in the counties of Carlow, Kildare, Meath, Wicklow, etc., and from Athlone to Kinnegad.

There were in all nine of these Trust Roads.

The Commission were to inquire into the revenue and debts and the nature of the mortgages in each of these trusts, with the object of each road being dealt with in accordance with its financial condition and its then value to the counties.

Although I have not been able to see the Royal Warrant or any copy of it, I am satisfied that Colonel Harness was a member of the Commission, and most probably Mr. Hayward was another member. Mr. Hayward was not on the Board of Works, or, so far as I know, connected in any way with Ireland.

On the report made by these gentlemen—the date of which I cannot get—a Bill was introduced by the Government in the Session of 1855, which was passed and received the Royal Assent on the 16th July, 1855, intituled an Act to discontinue the taking of tolls on the turnpike roads leading from the City of Dublin, and on the turnpike road from Kinnegad to Athlone, and to provide for the maintenance of such roads as public roads, and for the discharge of the debts due thereon and for other purposes (18 and 19 Victoria, c. 69). The enactment provided, amongst other things, viz. :—

(1) That future maintenance of such roads should devolve on counties and baronies as ordinary Grand Jury roads.

(2) That all arrears of interest on debentures and mortgages should be extinguished.

(3) That the debentures, etc., in respect of three of the roads should be discharged in full, and that in the other cases the amount chargeable should vary from *nil* to one moiety of the respective debts, recognising that the value of the roads to the counties was less than the debts.

(4) That in the County of Dublin the charge should be borne wholly by the baronies in proportion to the length of road in each barony; that in the other counties the charge was to fall on the county at large and the baronies in equal moieties, on the latter in proportion to the length of road running in each barony.

The above shows that, although Colonel Harness's later view as to throwing a part of the debts on the City of Dublin was not adopted because of its not being in accordance with the Grand Jury laws of Ireland, in other respects full effect was given in the Act to the principles expressed in the memorandum which he no doubt brought before the Commission to guide it in its report to Her Majesty.

Memorandum by Mr. Hayward on the apportionment of the debts of Turnpike Roads.

It appears from the recitals of the Acts under which the debentures were issued, that the money was borrowed to repair and improve the roads which the counties and baronies were bound to keep in good condition. The money thus raised, then expended and still unpaid to the holders of debentures (exclusive of arrears of interest) is at least four times the amount of the aggregate sum proposed to be imposed on the cesspayers of the several counties and baronies in which the roads lie, without including the £23,000 odd which the Mullingar Trustees expended out of surplus tolls in what they described as necessary and permanent improvements on the Mullingar Road.

Under these circumstances the counties or baronies (as the case may be) will be gainers by having had the roads taken out of their hands for a period, to be eventually returned in a highly improved condition with a debt.

There is no reason why, as a general principle, any charges incidental to the abolition of an unjust system should be thrown on those who have suffered from it during its continuance, and will consequently be benefited by its removal—on the contrary, such charges should rather be imposed on those who have been benefited by the wrong whilst it lasted.

In the present instance, the counties and baronies have been

the gainers, by escaping from their original obligations at the expense of the toll payers, many of whom were simultaneously paying to keep up toll-free roads and streets. These tenets were almost all established too long ago for their early history to be traced; but there is no ground for supposing that they originated with the city, and the lists of Trustees, from the earliest to the latest, are principally formed of influential proprietors along the lines.

One of the Cavan Acts was passed to shorten the mail road; but (with rare exception) there can be little doubt that the Acts were procured by those who threw off a legal duty by means of them.

If, however, we adopt the expected benefit as a test of equitable liability, the evidence is quite conclusive against the proposition to charge the city—for nine out of ten of the witnesses are owners and occupiers who complain of the injury to property beyond the city boundary. In fact, a person who founded his opinion solely on the evidence, would necessarily arrive at the conclusion that the turnpike system is a county or baronial *rather than a city grievance*; and that the best mode of imposing the charge on those who are to be most benefited would be to impose it on all owners and occupiers in the immediate proximity of the lines.

Owners and occupiers who have no occasion to use the road, and do not pay toll, will derive no benefit from the abolition, and yet will contribute equally towards the charges, great or small, that may be thrown on the cesspayers. This cannot be justified, except by the necessity of following out the principle of local taxation as we find it established, and if we follow out this principle the counties or baronies have no claim upon the city for a contribution.

The turnpikes on the Circular Road were an injury to the county as well as to the city; yet, when they were abolished by the Dublin Improvement Act in 1851, the entire debt was thrown upon the city, which is bound to keep the Circular Road in repair.

The Wide Street Commission stood in nearly the same relation to the city in which a Turnpike Trust stands to a barony or county.

It was invested by the Legislature with powers of acting independently of the ratepayers, and it had incurred a debt of about £30,000 without their assent; yet, when the management of their streets was restored to the citizens, they were burthened with this debt.

There are two instances in which the principle of local liability was strictly carried out to the disadvantage of the city ratepayers, who also may fairly say to the cesspayers: "We

have been at the entire expense of throwing open *our* roads and streets to *you*. It is for you to bear the expense of throwing open your roads to *us*."

Considering the water and railway communications of Dublin, and that the turnpike system is confined to a portion of the north side, the tolls can exercise no appreciable effect on the markets, or on the sanitary state of the city, as effected by the accumulation of manure (which is a subject of complaint in all great cities), and when visitors are prevented from repairing to the Botanical Garden, or any other institution in the country, by a turnpike, the *pecuniary* evil is really inflicted on the shareholders or trustees in respect of property in the barony. To go toll-free would be an accommodation to the citizen; but it is no more than he is entitled to in return for the use of the city roads and streets used toll-free by the cesspayer.

To argue on a different assumption is to dispute the justice of the law which throws the maintenance of roads on the district in which they lie, and by a parity of reasoning we ought to recommend that the city be compelled to contribute annually to the provincial roads. Were it necessary to argue this question, it might easily be shown that complete lines of communication are at least as necessary to remote or inland districts as to capitals which are seaports; but for the present purpose we must take the law as it stands, and assume an interchange of benefits on a perfectly equal footing.

The Borough of Drogheda (which, like Dublin, maintains its own roads and streets) has passed a resolution to the effect that the turnpikes on two of the roads are injurious to its trade. Each district bordering on the point at which either of the roads end might complain of the tolls on similar grounds, and it is difficult to see where we are to stop, or how we are to proportion the burthen, if we once depart from the rule of *strict local liability*. So long as this rule prevails, one district has nothing whatever to do with the roads of another, or with the debts incurred in relation to them. It would be as fair to make the county pay the debt incurred by the Wide Street Commission as to make the city pay any part of the debt of the Mullingar or Knockudan Trust.

When one party is injured by the neglect of another to perform a legal obligation, he may either proceed to compel its performance, or execute it himself and call on the others for repayment of the cost. In the case under consideration, the counties and baronies are merely called upon to pay a portion of the cost of supplying their defaults.

This very principle of responsibility for necessary outlay on roads has been applied by the General Grand Jury Acts (6 and 7 William IV., c. 116) by which the Commissioners of Public Works, on the requisition of the Postmaster-General, are authorised to repair mail roads, and enabled to recover the money so expended from the barony or county chargeable with the repairs. The County of Dublin Grand Jury Act (7 and 8 Victoria, c. 106) contains similar provisions (11, 62, 65).

*Captain Harness's Reply to the foregoing Memorandum by
Mr. Hayward.*

I agree with Mr. Hayward in the opinion that the roads named in our commission should not any longer be mentioned as turnpike roads under special Acts of Parliament ; but that for the future they should be mentioned under the provisions of the Irish Grand Jury Acts, like the other roads, with very few exceptions in Ireland.

The only difficult question to be considered in forming an Act of Parliament for the abolition of these trusts will be that arising from the claims of the debenture holders. When it was desired to consolidate the similar turnpike trusts in South Wales, the Legislature deemed it just to pay off the debenture holders, on a valuation fixed by impartial Commissioners ; and I see no reason why the same course should not be resorted to in this instance.

But it is more difficult to determine on whom it will be just to impose the charge that must be incurred in paying off the debentures. In the case referred to, the payments on account of the debts of the trusts within each county were charged upon that county ; but the right to levy tolls upon the greater part of the roads, being also given to the counties, and the debt being reduced to its fair value, and charged to them at a moderate rate of interest, the burden was hardly worthy of consideration.

Mr. Hayward is of opinion that the equitable obligation to pay off the money due on debentures should be considered to accompany the legal obligation, under existing general

Acts of Parliament, to maintain the road when the special Act is repealed. In this I do not agree with him. On the dissolution of a turnpike trust in Ireland the responsibility of the repairs of the roads falls upon the locality under the existing laws; but there is no law under which the debts of a trust can be allocated, and to determine this question by the analogy of Acts of Parliament which have been discussed and passed without reference to it is not likely to prove an equitable course, for, Acts of Parliament are only the conventional adjustments for the time they last of the particular cases included within their provisions, and do not constitute a code of right and wrong. In the case of those by which taxation is regulated, almost necessarily in many cases, there is a compromise between that which is just and that which is practically convenient.

We ought not, therefore, to infer that because the cost of the formation of a new road or the extensive improvement of a road in Ireland, when not effected by constituting a trust, is defrayed by the county or barony in which it is situated, that therefore a debt of the description referred to should be so borne. With respect to the expenditure on an improvement a county is able to exercise its discretion, while with respect to the debts of a trust the county has exercised no control. And, if a road which has been a very important line of communication be thrown upon the locality, it is probable that the debt upon it may far exceed the amount which a county would now consent to expend in improving it, if delivered back to them in the state in which the trust received it.

The fact that any road has been placed under trust must be received as evidence that there was some sufficient reason for exempting it from the general loan, and that there were parties who would be benefited by its being improved to a greater extent than the locality could be required to improve it. If this be so it cannot be right that a debt incurred in effecting this improvement should, after a lapse of time, be thrown

upon the parties intended to have been protected ; it appears clear that those for whose benefit the expenditure was incurred should bear the debt.

The roads referred to our consideration are, for the most part, portions of the principal communications between Dublin and the North, West, and South of Ireland ; it appears hardly to admit of question that the commerce of Dublin received as much benefit from the improvement of these roads, as the localities where communication with that city were facilitated.

It is not probable that the citizens of Dublin would have allowed an exceptional system to be established by which more than half the outlets of their city were to be closed by turnpikes if they were not to derive a benefit commensurate with this inconvenience, and it is difficult to suppose that if the gates near the city boundary, of which the gross receipts must be nearly £3,000 per annum, be removed, the city will not benefit either directly or indirectly to an amount equivalent to a considerable portion of the debt to be allocated.

It is impossible to arrive at any definite conclusion with respect to the degree of advantage which has been conferred upon different sections of the country by the improvement of these roads, or with respect to that to be derived by the abolition of the tolls. If by a general measure the turnpike system of maintaining roads were to be at once abolished throughout Great Britain and Ireland, no one would hesitate to recommend that the remaining debts, at a fair valuation, should be spread over the whole community, or that they should be met by the general revenue ; in which case each portion of the country would contribute towards the necessary expense attending the change of system according to its valuation, and not according to the particular extent of benefit received. In like manner the particular section of Ireland within which the turnpike system has been admitted, and from which it will be abolished by the dissolution of the nine trusts in question, might be marked out, and the debt distributed

upon it without excepting the towns which may be comprised within it.

(*There is no signature, but the original is in Colonel Harness's handwriting.*)

List of Public Offices, Ireland, of which Colonel Harness was a Member.

Commissioner of Public Works	-	1 and 2 William IV., c. 33.
„ Lunatic Asylums	-	1 and 2 George IV., c. 33, s. 5.
„ Kingstown Harbour	55	George III., c. 191.
„ Dunmore Harbour	58	George III., c. 72.
„ Donaghadee Harbour	1	George IV., c. 113.
Board of Control of Royal Canal	-	58 George III., c. 35.

Letters on leaving the Board in Ireland.

June 15th, 1855.

MY DEAR HARNES,

Although I rejoice in your new appointment *on your own account*, I cannot but feel that your leaving this Board at the present time will be very detrimental to the public interest: no new hand can efficiently fill your place. We have now arrived at the critical point, and if it is possible, as you suggested on a former occasion, that a portion, even a small portion, of your time could be occasionally given to us, to assist in deciding on the amount of reduction from the gross expenditure in each drainage case which should be recommended to the Treasury as a recompense to the proprietors, and afterwards assisting in the making of the accounts during, say, the next six months, I think we might be able to struggle through our difficulties.

I admit I am suggesting a very disagreeable duty, but you will see the public importance of the arrangement I propose. I beg you will consider it, and let me have your opinion, as I shall not communicate with Mr. Wilson till I hear from you.

Of course, a new Commissioner must be appointed who would act with us, and when the present pressure is over we might be able to get on without your assistance; but I feel we require your aid, and in fact it is absolutely necessary in connection with the drainage districts in progress, particularly those of Galway and Mayo, and the Kilbride, Kilmaganny, and Castle Bernard

in the King's County, and possibly the Upper and Lower
Brusna, but the latter are perhaps not indispensable.

Yours faithfully,

RICHARD GRIFFITHS.

Lieut.-Colonel Harness, R.E.

June 15th, 1855.

MY DEAR GRIFFITHS,

I am much gratified by the wish expressed in your
note to be still able to refer to me on questions connected
with the remission of charge upon the drainage districts.
I can only say that, on whatever subject my opinion is
requested by you in connection therewith, it will be felt
by me to be my duty to endeavour to form an opinion,
so far as the claims on my time and attention of the
duties now assigned to me in connection with my own
corps, will permit.

Yours faithfully,

H. D. H.

CHAPTER V.

THE WAR OFFICE, 1855-6, AND MALTA, 1856-7.

BY MAJOR-GENERAL COLLINSON, R.E.*

In the War Office.

THE Crimean War of 1854-56 brought before the public notice, in a most startling and, indeed, humiliating manner, the complete unpreparedness of this country for a serious war. Since the peace of 1815 there had been no call on it for any extensive warlike operations; the Army and Navy had been reduced to what was merely necessary to display our intention to hold the position in the world we had established at that peace: and the organisation, equipment, and character of the warlike stores, remained practically unaltered. In the one great military arsenal of the country at Woolwich, the ideas and practices were still those that had been brought into existence during the French War: and the general pacific tone of the country, even up to 1851, was such that the Great Exhibition of that year was thought to be the commencement of a new era in which commerce would stamp out war.

The Crimean War rudely awoke the nation to their mistake and showed our deficiencies in the art of war, so strongly, that a complete reformation of our military system was vehemently demanded by the country: and at once a Secretary of

* *Written in 1898.*

State for War was appointed, in whose hands the management of the whole of our military preparations for war was placed. This concentration of the several departments of our war machinery under one head, though it appeared theoretically an admirable remedy for all difficulties, has proved in practice not to have produced the personal responsibility and smoothness of working that was expected of it.

Before that time the military affairs were managed by five distinct offices :—

- 1.—*The Commander-in-Chief's Office*, dealing with the *personnel* of the Army and its discipline : directly responsible to the Crown.
- 2.—*The Ordnance Office*, providing the munitions of war, barracks and fortifications, and commanding the Artillery and Engineers ; directly responsible to Parliament.
- 3.—*The Commissariat*, providing the money and the food and transport : under the Treasury.
- 4.—*The Secretary at War*, who controlled the accounts and superintended the execution of the Mutiny Act.
- 5.—*The Minister of War*, a member of the Government responsible for the general conduct of campaigns.

These offices really remain to this day ; and although the *Minister of War* is now the controlling head of them all, the latest warrants provide for the personal responsibility of six heads of Departments under him, namely :—(1) *The Commander-in-Chief* of the Army, which now includes the command of the Artillery and Engineers. (2 and 3) *The Adjutant-General* and *Quartermaster-General*. (4) *The Director of Ordnance*, who provides the munitions of war. (5) *The Inspector-General of Fortifications*, who provides barracks and fortifications, and has a certain control over the Engineers. (6) *The Commissariat*, who are in communication with the Treasury.

Besides this organisation there is a professional Grand

Council of War, including representatives of the Admiralty as well as of the War Office ; and above all of them there is understood to be a special Committee of the Cabinet, to direct our warlike operations both by land and sea.

Lieut.-Colonel Harness's Appointment.

In 1853 Harness, then employed as one of the Commissioners of the Board of Public Works in Ireland, was appointed Deputy Inspector-General of Fortifications at the War Office, to assist in the reorganisation of that branch of the new War Department.

On his arrival at the War Office in the autumn of 1855, the two Deputy Inspector-Generals of Fortifications and the Director of Stores (formerly a member of the Board of Ordnance) were appointed by the Secretary for War to report on the reorganisation of the civil branch of the newly-formed War Department, which was still working under the old organisation ; the only authorised change as yet made being the substitution of the Secretary for War in place of the Board of Ordnance.

The draft report of this Committee is one of the papers proposed to be kept at the S. M. E., Chatham. As it is in Colonel Harness's handwriting, and corrected by him on the notes of (apparently) his colleagues, we may assume that it represents his views, if not entirely those of the other two members. As a good record of the older system, and of what he (at least) considered desirable for the new one, it is worth preserving : for we must bear in mind that ever since that date there have been changes in the organisation then established up to the last year (1895) ; and as these changes have been, in a way, tentative, it is probable that modifications will be still required, and therefore the records and opinions of a man like Harness will be found useful.

The following letter written by Colonel Harness, upon a proposition by Sir Charles Trevelyan about the distinction between civil and military duties in an establishment like the

War Department, expresses in clear and strong manner, characteristic of him, his views as to the organisation of the War Department in its higher branches, as well as his feelings on the subject of the loyalty of a soldier to his individual commander. With him loyalty and devotion to the orders of his commander, whether Captain, Colonel, General, or Sovereign, was like a religious duty.

“ I return Sir C. Trevelyan's paper. It discusses the administration of the civil branches of the army with ability, and evinces an acquaintance with military finance and commissariat arrangements derived from his official career which probably no other British subject possesses.

“ There is nothing in that paper which suggests that the care of barracks occupied by troops, and the care and construction of military defensive works, shall be considered civil duties ; on the contrary, it recommends that the Engineers and Sappers and Miners should be transferred to the Commander-in-Chief, which would not be the natural arrangement if none of the duties for which they are maintained are to be under his control.

“ With respect to the recommendation for the civil side of the administrations, while entirely agreeing with most of the suggestions, to secure efficiency in the administrations, I am not of opinion that it would be right to create a British intendance after the French mode, under the English Minister of War. When a Sovereign can choose a Minister of War or a General with nearly equal freedom, there is no more danger of difficulties arising from the civil or military branches of an army, organised like the French, not working in unison, than from the disagreement of two Brigadiers. But with us the case is different. The political opinions of an English Minister of War may be of any description. It is possible that a man of Republican principles may hold this office, adverse in heart to a Monarchy, and disbelieving any monarchical feeling in the military portion of the army. Or, even without this possible antagonism, those who are work-

ing under him might receive undue support in opposition to the General of an army; or he might, perhaps, maintain a correspondence with the head of the civil staff with respect to the operations of the General, and create a feeling of independence in the former, and of suspicion in the latter, totally incompatible with the effective working of an army.

“It appears to me that there is no alternative with an English army except to make the civil administration subject solely to the authority of the Commander-in-Chief, with this exception only, the accountants of an army should be the servants of the Treasury, the military chest should be in their hands, and they should be charged with the financial steps necessary for its replenishment: making imposts and payments on the authority of the General, or of those authorised by him to order them.

“It may be said that the unity desired could be obtained if the military branch of the army were equally with the civil under the direct authority of the Minister for War. But this is to suppose the transfer of the command of the army to Parliament, which, in my mind, is a treasonable supposition. Nor do I believe it possible for a popular assembly to retain the affections (*i.e.*, the spontaneous allegiance*) of any army. The character of every popular Assembly, as created in the mind by its Acts, must be opposite to that character which the training and habits essential to military success produce. And the soldier of a Republic is certain to love a successful General more than a vacillating Chamber of representatives.

(Paragraph omitted, being illegible.)

“What, then, is an English Minister of War? He should direct the large operations of a war, and conceive and effect the combination of British forces from different quarters, by which the enemy is to be attacked.

(Paragraph omitted as unnecessary.)

* I think this is what he meant.—[ED.]

“ But the units with which he deals are an army and a fleet. The internal administrations of the former are not necessarily any part of his duty, and ought not to occupy his time. The care and the replenishment of the national magazines of every description of military stores is a part of his duty, but when issued to an army for use they cease to be under his control. The manufactories and principal depôts, at home and abroad, are his ; the expense magazines are under the officer commanding the force to which they are issued. The control, under Parliament, of the expenditure, belongs to him ; but that control consists in the examination of the periodical or special estimates on which it is based and the approval or disapproval of their several items.”*

*The Organisation of the Engineer Branch of the War
Department.*

About the same time (1856) this subject came to the front.

It was, of course, inevitable, in doing away with the old Ordnance Board, that the organisation of each branch of that Board and their connection with the new supreme authority should be specially considered. In the case of the Artillery there was little difficulty in making the new arrangements ; the personal command of that force, which had been hitherto under the Master-General of the Ordnance, could be without difficulty transferred to the Commander-in-Chief ; because the artillery was simply one of the three branches of the army as a tactical force on the field of battle ; their internal organisation was not different from that of the cavalry or infantry, and their duties in the field did not differ more than those of cavalry and infantry. But with the Engineers the question was more difficult. Their duties in war time are much more varied, and necessitate their being broken up into small bodies, quite detached from

* After this letter was written, the organisation of the army, including the War Office itself, was modified in the direction indicated in it.—[ED.]

each other and sometimes from the body of the army, and therefore they require a special organisation. And this applies equally in time of peace as in war, when they are called upon to perform a great variety of important duties, as for example the planning and construction of fortifications and barracks. The control and military command of the corps became therefore a very important question.

Under the old system the Master-General of the Ordnance was the military commander of the corps as well as head of the civil branch ; and the Inspector-General of Fortifications, who under the Master-General was head of the works branch as well as of the military branch, had no difficulty in managing both ; reporting to the Master-General on military matters and to the Board of Ordnance on others.

The old system had been devised during time of peace, and was more adapted for economy and routine than for the exigencies of war. The actual work done was both good and economical, but it was of comparatively small extent ; and when a demand arose for more extensive military works of all kinds the system was not prepared for it : and the question then arose whether it would not be desirable to put all the works, not actually for fortifications, under a separate management.

These questions were finally decided at that time by leaving the Inspector-General of Fortifications at the head of all the works branches of the War Department, and placing the military command of the Corps in the hands of the Commander-in-Chief, with the proviso that the I.G.F. was to be consulted in all matters affecting the disposition of both officers and men. That arrangement has been modified from time to time ; the last alteration (in 1895) being that the Inspector-General of Fortifications, who, like the Commander-in-Chief, is directly responsible to the Secretary of State for War, exercises more control over the disposition of the officers and men of the Corps than he did under the plan of 1855 ; and the further arrangement under which all com-

munications from the War Office respecting works pass through the hands of the general officers commanding districts, places the working of the Engineer Department more in harmony with that of the army generally than it used to be. A *C.R.E.* is now placed in his proper position, on the staff of the General Commanding, as his staff officer for all works.

Since 1855 many new duties have been placed on the Engineer Corps, both for peace and war ; and the much more extensive use of scientific machines in war has increased the necessity for a special organisation and management of the Corps, so as to give it an elasticity beyond that which the other branches of the army require. Officers who have mastered special scientific subjects and requirements will in future have to be more specially treated ; and the organisation of the men will have to be such as will allow of small bodies, and even individuals, who are practised in particular operations, being detached quickly, with full arrangements for their work and provisioning.

The following extracts from two letters from Colonel Harness, written about that time, show his opinions on certain parts of this subject :—

March, 1855.

“I should like to know what are the defects in the present working of the *Engineer Department*. I do not believe they can be in any way the result of the constitution of the Corps ; but suppose they are the necessary consequence of the Ordnance expenditure being rigidly controlled and checked by the system very properly adopted during a peace. I believe the barracks built by them to be much better and to have cost less than those built before the barracks were given over to them. And inasmuch as in the colonies and in fortified places new barracks or repairs and alterations must be made by them, it would be absurd to adopt a different system at home. Whether the ordinary repairs of barracks should be in any way effected by them is another question. It is thence, I believe, that come most complaints against us, and these will be the subject of complaint against whosoever is charged with them.

(Paragraph omitted.)

“As to military organisation, the natural arrangement seems to be, to make the Commander-in-Chief at home exactly what the Commander-in-Chief of any force leaving home must be—the supreme head of all the branches of which his army is composed. He is the head, under the Sovereign, acting through her Ministers, of the military occupation of Great Britain, and is charged with its defence. The Engineers are under him, and he disposes of them, *in garrison or on special duties*, as he thinks proper. The fortresses and barracks are at his disposal and are occupied or unoccupied, altered or enlarged or added to, by his order; and the latter would be, *alternately*, in charge of the Engineer ordered to build, repair, or reconstruct, or of the Quartermaster-General, for occupation. There is no division of authority here, and no one is working under two masters.

.”

May, 1855.

“. . . . The difficulties you state as having arisen, are not clearly comprehended by me. For neither fortifications nor barracks are civil buildings. Whenever we occupy a country militarily these will have to be formed and maintained by the occupying army: and the army occupying England should hold the same position with respect to its fortresses and barracks that every other force must hold with respect to their duties.

“But the establishments for making and preserving military stores to be distributed, as required, to our armies or fleets, wherever they may be, need not be interfered with by military Engineers. The mode of providing for the erection and maintenance of the buildings required for these establishments must depend on the views adopted in the organisation of the War Office. It does not appear absolutely necessary that any building branch should be formed within it. It can cause its work to be executed by the Commander-in-Chief, who would direct his Engineer officers to do it; or it can obtain the assistance of the Office of Works, which has now the charge of a large portion of the Tower (and of) all the public offices, and the Mint, etc.

“.”

These two extracts from his letters refer to the *Control of the Engineer Department*, and lay down a maxim which I think everyone, at least every soldier, must agree with in

principle ; namely, that the same organisation as regards government should exist in the Engineer department at home as exists in all our Colonies and Dependencies. That system, however, which is a necessity in distant possessions, is not quite compatible with the close control of expenditure for war purposes which our present Parliamentary government demands. If the six heads of departments, lately established, are to form a sort of board, of which the Commander-in-Chief will be the vice-president, then Harness's idea will be partly carried out. But only partly ; the Commander-in-Chief at home being only one of a board, all the members of which are responsible to the War Secretary, cannot exercise the same control over them that the Commander-in-Chief in a colony, from the necessity of his position, does over all the branches of the War Department in his command. And in that respect our War Department is weaker than the War Department of a country like Germany, where the Sovereign is himself the Commander-in-Chief of the Army, and is solely responsible for the expenditure of the money granted by the Parliament for its maintenance.

This weakness in our military system does not affect to the same extent the management of the Navy (which is also governed by what may be called a Parliamentary Board), because the Navy is felt by the country to be so absolutely necessary to our preservation that Parliament seldom refuses any demand earnestly made by the Minister on its behalf.

In 1856, Major H. C. Owen, C.B., Royal Engineers, was appointed to the department of the Inspector-General of Fortifications in the War Office, in which he shortly after became Deputy I.G.F. for the barrack branch. He was a large and a strong-minded man, and from his character and training he took broad views of the duties of the Royal Engineers. Previous to his service in the Crimea, he had been employed in connection with the new Science and Art Department, where he met with architects and artists ; and

he was personally connected with the great engineers and builders of the Cubitt family.

He conceived the idea that it would be better for both the Corps and the Government to take away the construction of barracks and civil buildings from the Royal Engineers, and put it under the management of civil architects, and with that object he made a proposition for increasing the civil staff of the Royal Engineer Department.*

The general idea of Major Owen's proposal appears to have been to divide the Royal Engineer Corps into two distinct branches, one for works and one for military service, which would have been somewhat in the direction of the system in France. On the works branch, he apparently proposed to employ civil architects as well as military engineers, and to do a great deal of the designing at headquarters.

The proposal of Major Owen naturally came under the consideration of Colonel Harness, and his views upon it are clearly expressed in the subjoined letter, and a letter from Sir John Burgoyne is added, showing how entirely he was in accord with Colonel Harness.

Colonel Harness regarded efficiency in the field in time of war as the first duty and requirement of the Corps of Royal Engineers, and he considered the designing and construction of works of all kinds in time of peace to be the best training the officers and men could receive to qualify them for their duties in time of war. He was, therefore, altogether opposed to the separation of the Corps into two branches as proposed by Major Owen.

January, 1856.

“Major Owen's plan must, I presume, be considered as an expedient which he would recommend to be adopted to meet the difficulty which now appears to be created by the present views of our political con-

* The same questions were, in 1902, considered by a War Office Committee, presided over by Lord Esher, of which Major-General Leach, V.C., R.E., and Mr. McIvor Anderson, M.I.B.A., were members.

stitution. I cannot suppose it to be one which he would consider it prudent for any absolute monarch to adopt in organising his army.

“At present, military works are carried on by the officers of Engineers (who must be attached as a necessary part of every military garrison, whether works are in progress or not, in numbers duly proportionate to it) of the particular garrison where those works are being executed. This appears the natural arrangement. Whatever organisation a military force is to have when in the field, whatever the dependence of its parts, and the duties of its individuals are to be at that time, should, to the utmost extent which the circumstances will permit, be preserved during peace. It is only by this course that an army can be kept prepared for war. The duties on which our Engineer officers are employed are at present as well adapted as the duties of peace can be to effect this object, and there is nothing in these duties to prevent their being frequently employed, perhaps for exercise only, but often with some useful object, in making reconnaissance reports and projects which will give them practice on subjects likely to be required to be dealt with by them in the field.

“Their duties in a campaign embrace every description of work that any Engineer can have to deal with. It is true that each actual work is likely to be of small extent compared with those undertaken during peace, but, on the other hand, it has to be conceived and executed with far greater rapidity and far inferior means. Our officers will not be better fitted for rendering a fortress that has been captured in one campaign ready to resist a siege during the next if they neither design nor build one new fortress. Nor to drain their encampments, or form an inundation in front of them, if all questions of drainage are taken out of their hands; nor to follow a retreating enemy and restore the bridges destroyed by him, if they have never dealt with the framing of timber as a duty, but only thought of it during a lecture or as an exercise. I have from the age of nineteen or twenty regarded the profession of a Military Engineer in the British Army as the best for his own improvement that a man can choose. The different subjects presented in succession to the minds of our officers are calculated in a degree which cannot, I think, even be the case in any other profession, to enlarge his capacity and fit him for practical life. At one time he is making a survey, and varying the delicacy of his process to suit the degree of accuracy required in the

particular parts of his operations, from striving to obtain the utmost accuracy that can be derived from material instruments to measuring by paces and determining directions by his eyes. He thus learns in rapid operations carefully to adopt his means to his end. At another time he is like other engineers dealing with a subject which admits of no satisfactory investigation, and he has to distinguish the elements affecting it which are comparatively insignificant, and by the partial neglect of which he may simplify his injury, and to obtain by well-chosen experiments the data necessary for applying his results. He thus learns to analyse carefully the circumstances affecting his opinions and decisions, and to give the proper relative value to each. He moves from this country to a colony, and from one colony to another, and finds as he moves that the circumstances affecting the designs for works are so different that he cannot adopt mechanically the forms or processes of one plan at any other; not only the climate but the relative pieces of labour and materials, and the qualities of both, and the nature of the working parties supplied to him, vary in every possible degree, and call for different applications of the principles of construction, and he acquires a habit of ascertaining the causes of the different practices and processes he finds in life, for the same purposes, and of varying the organisation of his working staff, and the extent of his personal interference with the execution of the works as the character of the labour at his disposal is varied. And he cannot be called upon to report on the defences of a single point, however insignificant, without reviewing in his mind a great variety of circumstances which may impede or facilitate both the attacks and defence, in addition to the mere strength of the position.

“While thus educated by his professional duties, he is also essentially a soldier, carrying them on as one, mixing with the rest of the military force as one in all respects, and taking his part in the most important military duties. He retains, as we believe other officers of our national army to do, uninjured the chivalrous sentiments with which, starting from an English school, he most probably began his career.

“If the character of the officer likely to be produced by these duties in time of peace be well considered, it ought to be seen that an invaluable agent for war is in the hands of the State. But every person who employs another must suit the employment to the nature of the qualifications and the temper of the person to be employed.

The variable nature of the duties which will have enlarged the general capacity of the Engineer officer and tended to qualify him (while retaining him as a soldier) for an excellent administrator of works, has at the same time kept him from becoming familiar with the mechanical processes by which works are executed, like those whose lives are devoted to one description of work in one place. His duties are constantly changing in peace, and so they would be in war.

“To continue to prepare such men for our army and to increase their utility to it, I should propose a totally different plan to that recommended by Major Owen (I disregard here the constitutional difficulty, for if we are to be able to defend the country against an enemy, that must be remedied without destroying the unity of our military force). Instead of increasing the civilian staff of the Engineer department, my wish would be to increase the Sappers, and as far as possible to carry out in the management of our works a purely military system, dependent on their organisation, whether the labour employed be working parties of troops, or civil labourers, or convicts, or whether it be the subject of a contract.

“The Sappers even now are able to produce all that we require. Two Sappers are practising as civil engineers in Ireland, one of them has built the new docks at Limerick. Several are, I believe, practising as surveyors in this country. To effect a more perfect military organisation, and obtain an Engineer Department which shall not be dependent in peace on civilians, and in war on Sappers, is of more importance than that our military buildings shall bear comparison as works of art with the works of civil architects.

“One word for the supposition on which all the difficulty that has arisen, and which is perplexing us, is supposed to rest. It is that the Minister for War is not only the approver and comptroller of military works, but the executor of them also. I cannot believe that our constitution compels so absurd a combination of duties in one individual. When a General (as the Master-General of Ordnance formerly) recommends a military work to be undertaken, the Minister can, and ought to, investigate completely its necessity and the character proposed for it, and approve or disapprove. When Parliament has voted the expenditure, it should be forthwith at the disposal of that General for the purpose for which it was voted, and for that purpose only; neither he nor any of his officers being the actual paymasters.

The responsibility of the Minister or comptroller is evidently limited to seeing that the money has been expended as voted and not otherwise ; and that the military system under which he knew it must be spent when he approved the works was one in the honesty and sufficiency of which he had reasonable confidence. . . .

“ I will not extend my letter into the question of designing our works, but I shall be ready to make this the subject of a distinct report to you if you wish it.

“ H. D. H.”

The date of above letter is unknown, but the following note from Sir J. Burgoyne, acknowledging it, is dated

Brantsea Castle,

MY DEAR HARNESS, 20th January, 1856.

The principles you lay down, in contradistinction to those of Major Owen, for the service of the Engineers for peace and war combined, are admirable ; such a service is the only foundation we, or any country, has, for a scientific, working, and theoretical, body, for all *military* operations, whether in field or garrison. A mere practical *Sapper and Miner, Builder of batteries of earth, and Surveyor*, would most imperfectly fill the many important wants that are required in the field from the *Engineer*, as you have clearly exemplified ; and there could be no finer school than the full charge of works, in design and execution *at all times*. If we are less qualified than we ought to be, I would recommend to apply the best remedies to remove our incompetence, rather than place the Corps on a lower level, and make up the deficiency by the employment of substitute civilians as proposed by Owen.

I hope you will follow up your remarks by a sequel on the best system for the designing of works, etc.

Yours faithfully,

J. F. BURGOYNE.

It is worthy of remark that in his examination before the “ Committee on Barrack Works ” of 1862, referred to further on in another Chapter, Colonel Owen (as he was then) modified his views considerably, having then gained experience as Commanding Engineer at Plymouth ; where he had a small body of the Corps employed under him on the new fortifications, whose value he fully appreciated.

He had then come to the conclusion that if the Engineer

officers and some of the men had a better training in the science of construction generally, they would be capable of executing all the works required by the War Department, as well, if not better, than civil architects.

The following Memorandum by Colonel Harness, written (probably) in 1856, on a proposal for the re-arrangement of the *Commissariat*, the *Ordnance Store Department*, and the *Transport Corps*, will be found interesting :—

I have read the papers, and do not quite appreciate the meaning of the replies of Mr. ——— to the paragraphs marked 2 and 3 by him. But it appears to me that he considers the Ordnance Storekeeper and the Commissariat to be virtually amalgamated, by being brought under the same department of the executive government. And so far as the Commissariat duties in garrison (apart from the care of the military chest) are concerned, there does not appear to be any ground whatever for maintaining a distinction; for both the Commissariat officer in a garrison and the Ordnance Storekeeper are now storekeepers of the War Department. I suppose the only real question relates to the transfer of the military chest from Commissariat to Treasury control, and probably eventually to the Paymaster-General.

There can be no doubt that, in garrison, no inconvenience could arise from the separation of the cash and store transactions. For we have had a long experience of the perfect facility with which works can be carried on and paid for in the Colonies, while the separation between the executive department and the paying department has been as complete as that now contemplated.

The wants of an army in the vicinity of an enemy, and its efficiency at that time, is the first object with every part of a military organisation. . . . *

But with respect to the Commissariat for the field, I doubt much whether the duties, either as a Commissariat officer in the Colonies, or of an Ordnance Storekeeper anywhere, are likely to constitute a desirable training. On the contrary, they must tend rather to unfit him for the higher duties of a commissary of an army. It has always appeared to me that the Field Commissariat should comprise in its higher departments a body of

* A paragraph here in the original is illegible.

officers of peculiar mental character and great acquirement. To those lads at our military schools at Sandhurst and Woolwich who show, together with a good mind for mathematics, a power of acquiring languages, and a taste for collecting geographical information, the Field Commissariat should be open, as a branch of the staff of the Army under the Commander-in-Chief. The number permanently kept of such a staff, during peace, would not be large; while a portion should be continually employed at such times, in connection with the staff of each military district, that they might be accustomed to act together, whilst a portion should be constantly employed in collecting information, and reporting on the markets and resources of other countries, and on the commissariat arrangements of foreign armies.

With respect to Transport: it is obvious that no arrangement can be worse than that which imposes on men who during peace have no duties but those of an office for cash and other accounts, the added charge in time of war of several thousand animals, and the extensive command of men. We reaped the fruit of this last winter (1855-6); it was a principal source of all our calamities. The Commissariat must generally be the body requiring the largest amount of transport with a moving army; and where the success of Commissariat arrangements must be dependent on complete control over all its moves, an independent Transport Corps is not a rational system.

Probably the Transport Corps should be separate as a branch from the storekeeping and issuing branch, but both be brought together under one head, the Commissary Provider, above mentioned. The supply of Transport by the Commissariat to other branches of the army should be limited to extraordinary demands, every branch having for ordinary occasions the means of transport within itself. Our forces would be more ready to take the field, if in peace some means of transport were always in charge of every regiment, and they were accustomed to the care of it.

Letter from Colonel Harness to Sir J. Burgoyne on a proposition for the separation of the BARRACK BRANCH completely from the FORTIFICATION BRANCH; which, however, was not carried out.

MY DEAR SIR JOHN,

Date about 1856.

I regret exceedingly the intention expressed in this letter of separating completely the organisation of the

three branches of your office. I expressed the opinion that it was necessary for its proper working to produce the most perfect amalgamation of the new branch that had been created, by adopting from the Board of Ordnance the branch of that department which controlled the occupation of barracks, and amalgamating with it that portion of your duties which relates to their construction, before I had been a week in London, and have never changed that opinion, but have expressed it more than once to yourself and others.

The control of the occupation of barracks is not necessarily connected with their construction; nor has it hitherto formed any part of the duties of officers of Engineers to interfere with it. And the administrative direction of the casual repairs of barracks, if these were not executed under the superintendence of the officers of Royal Engineers, might also be separated from your central control. But while executed by the Royal Engineers, as a part of their duties under your orders, with a staff of officers for whose efficiency and discipline your Deputy-Adjutant-General is responsible to you, their reports ought to be received and so recorded in your office that all the duties carried on by any officer shall be ascertained by a single reference.

But, it is not only necessary for the maintenance of the proper organisation, the uniform system of working, and the discipline of our Corps; indeed, I believe it to be impracticable, without much difficulty and confusion, to carry on, as entirely distinct branches, the construction of barracks and the construction of fortifications; except in those cases where the barracks are not to be constructed on ground retained for defensive purposes. The choice of the site for a barrack in any place where the space available to the War Department is restricted cannot be separated from defensive considerations. And if it be possible for the height of a particular part of the barrack to affect the defence, or if the foundations render any important quantity of excavation necessary, there must be a mutual co-operation in the arrangements for the design and the execution.

The same difficulties exist with respect to the buildings which we have termed "Civil buildings." The term is so ill understood that I find similar classes in the printed estimates, clauses under that head and under "Fortifications": but I suppose it to comprise Ordnance, and Commissariat houses and stores. It is to maintain and protect such establishments for the support of our naval

and military operations that positions are selected and fortified ; and the proportions of the works and the capacity and arrangements of the buildings must all be considered with reference to each other ; and even when these buildings have been constructed, an alteration of their appropriation must be made with reference to defence. A proposition to make Tilbury Fort the general depôt for ammunition came before me a few days ago : perhaps as "gunpowder," it would have been considered as connected with "Fortifications," and therefore sent to me ; but if it had been proposed to make it the general Clothing Depôt, it would have been equally objectionable.

Retirement from the War Office.

A proposition had been made officially by Mr. Monsell, who was then Financial Secretary at the War Office, to Colonel Harness, "whether a civil architect could be employed in the office of the Inspector-General of Fortifications."

The following is Harness's reply taken from his draft memorandum :—

" 20th November, 1855.

"You asked me this evening to consider whether a civil architect could be employed in the office of the I.G.F. The question standing alone would appear to imply that there is a civil architect for whom it is desired to find a place, either in that office among others, or in that office particularly. The honest answer to such a question must clearly be, No. We cannot devise occupation to gratify such a desire. The civil professional staff of the office of the I.G.F. ought to be selected from the clerks of works in his department, as long as fit men for the duty required can be found in that body.

"Wishing, however, to reply to your question fully, I try to consider it in connection with the conversation which preceded it, relating to the execution of the works in the Arsenal at Woolwich, and the works at Waltham and Enfield, which are now looked upon as purely civil works. These could undoubtedly be superintended by civilians, for the two officers employed in them are at present regarded as "seconded" for civil duties, and, consequently, as civilians. Now in this sense I do not consider that a civil architect could be employed in the office of the I.G.F., nor out of it, for the principal superintendence of any work under his control. At the

same time, if it be desired to maintain permanent barracks as civil works, and to relieve the Corps of Royal Engineers from all charge and responsibility with respect to them, then there will be employment for a civil architect in the War Department, but not as a part of the official staff of the I.G.F.

“Whatever works are carried on as military works by the Corps of Engineers, and carried on by them as a military body, under the military control of a proper military staff, the head of that staff is the Inspector-General of Fortifications, who is the only authority from which the officers of the Corps can receive any orders, except those given to them by their immediate superiors in the portion of the Queen’s army to which they may at the time be attached. They are raised as a military body for the execution and care of such military works as well as for other duties alluded to in the warrant under which they are constituted. These duties are as much their duties as those of Infantry, Cavalry, or Artillery, soldiers, are theirs; and if the permanent barracks were to be again treated as civil buildings, as supposed above, and these duties placed under a civil architect, the officers of Engineers must certainly be relieved from their charge, for they can no more receive an order from a civilian than a regiment can upon parade.

“With respect to the present professional staff of the office of the Inspector-General, I consider it insufficient; but an architect, in the sense in which that word is generally applied, would be comparatively useless. One or two men are wanted, having each much practical experience, but of different description; they should be of the class of clerks of works, and if they can be found among them who are already in the department in that capacity, should be chosen from them.”

With reference to this letter, it is right to point out that the insinuation made in the first part of it, which was the cause of the dispute with Mr. Monsell, had some foundation, though not in connection with that gentleman; another officer, in the same branch as Harness, had previously made the same proposition to him, in a more definite form. But it was wrong to make the supposition to Mr. Monsell, and Harness must have felt that it was so, because he had an interview with that gentleman soon after, which he thought

had cleared up the matter. That it was not so cleared up is evident from the following letter to him from Mr. Monsell, which expresses the latter's feelings very strongly. Thanks to Sir John Burgoyne's kindly influence, Harness withdrew the obnoxious epistle, as will be seen by the letter following the above.

" Pall Mall, *December 3rd*, 1855.

" DEAR SIR,

" I have waited two days in the hope that after the interview I had with you on Saturday you would have written to withdraw your letter of the 30th of November, and to apologise for it. My object in holding that interview with you was to avoid, if possible, the necessity for that formal demand for an apology which otherwise would have been immediately necessary.

" Keeping this in view, and recollecting the confidential terms on which we have been for some time, I thought it not inconsistent with self-respect to assure you that, so far from there being any ground for the offensive insinuations contained in your letter, if it should be decided to employ a civil architect here, I had not the most remote idea how we should set about to find one, nor was there any person about whom directly or indirectly, personally or politically, I was interested, for whom I wished to procure such a place.

" You must be aware that neither privately or officially would you have any right to expect or require such an assurance from me. I gave it partly to relieve my own mind, and partly to facilitate your prompt reparation of the offence you had given me.

" However, you have not thought fit to make any written communication to me. Your letter, therefore, stands on record, and I am compelled to take up the subject where that letter left it. I beg, then, to remind you that in the discharge of my official duty I asked you to give me in writing your opinion, not 'whether a civil architect could be employed in the office of the I.G.F.,' but whether it would be advantageous to the public service to employ a civil architect in that office. Your duty was to reply simply to the question put to you. But instead of this you chose to write me a letter, the first sentences of which conveyed in the most undisguised and offensive manner a gross personal insult to myself, by imputing to me a desire to create a new office for the

purpose of providing for someone for whom I wished to find a place.

"In other words, you accused me of a flagrant breach of public trust, and of a designed malversation of public money. It is impossible, however groundless or frivolous such a charge may be on the face of it, that I can submit to lie under it, made as it was, not by an anonymous or obscure or ignorant person, but by an officer in my own department, who is bound to render me official respect and obedience, and with whom I am habitually in the closest official communication. I must, therefore, call upon you formally and in writing to withdraw your letter, and to apologise to me for the insult it conveys in the most distinct and unqualified manner.

"I am, dear Sir,

"Yours faithfully,

"W. MONSELL.

"Lieut.-Colonel Harness, R.E."

Pall Mall, 20th December, 1855.

DEAR SIR JOHN BURGOYNE,

To avoid showing any desire whatever to offend Mr. Monsell, which Lord Panmure considers might be supposed from the first paragraph of my letter of the 30th ult., I wish to withdraw that letter by exchanging it for the enclosed, to which it is impossible to attribute any indirect meaning.

Regretting the trouble this subject has given to you, and hoping this note will relieve you from any further annoyance in connection with it,

I am, dear Sir John Burgoyne,

Very sincerely yours,

H. D. HARNESS.

Whether this modified letter did not altogether remove the sting of the first one, or whether neither of the two officials concerned could return to that condition of confidential intercourse essential in a public department, there was such a restraint between them that Lord Panmure, then the War Minister, felt compelled to interfere; he had, in fact, to decide which of the two, Mr. Monsell or Colonel Harness, should leave the office.

The three following letters explain the circumstances of this final action; and they also show the strong feeling of regret on the part of Lord Panmure and of Sir J. Burgoyne that it

should have been necessary to come to that conclusion. Harness's reply shows also the extreme sensitiveness to allowing any imputation of improper conduct to rest upon him which characterised his action on several other occasions of a somewhat similar character. That a man so sensitive to honourable feeling should make such an insinuation to a high official implies that he had some strong previous conviction of its truth, not as concerns Mr. Monsell personally, but some official in the department.

The two final letters confirm this feeling of regret at the whole affair by two of the principal persons concerned.

To Sir J. Burgoyne, I.G.F.

MY DEAR SIR JOHN,

I find that matters are proceeding with no prospect of the renewal of those terms between Mr. Monsell and Colonel Harness which must exist if business is to be carried on satisfactorily in my department. You are aware of my opinion that these relations were first broken up by a very improper insinuation against Mr. Monsell by Colonel Harness, which ought never to have been made even in jest, and had they been on an equal footing in the department, but considering that Mr. M. holds a position secondary only to my own, and that the thing was done in solemn earnestness, it was very wrong.

I have come to the conclusion that, much as I value Colonel Harness's professional talents and great aptitude for giving advice on subjects connected with his scientific acquirements, that he will work better somewhere else, and I will be obliged to you to make some arrangement which shall save me the pain of making any change in the department by any move of my own.

Yours faithfully,

PANMURE.

W.D., *March 14th*, 1856.

War Department, Pall Mall,
15th March, 1856.

MY DEAR COLONEL,

I enclose a copy of a letter from the Minister of War, wherein you will perceive that he considers it necessary that, when the requisite arrangements can be made, you should be removed from your present office to some other position.

I have to assure you that I shall regret exceedingly to lose your services in immediate connection with my own duties, as I have met with nothing from you but the most zealous co-operation and an anxious desire to meet all my views, with talents and professional knowledge that I cannot expect can be replaced.

Under these feelings, and estimating your character and abilities as of the highest class, I shall consider it as your due to endeavour to conform to your wishes as to your future destination in so far as may depend upon me.

My dear Colonel,

Ever yours most faithfully,

J. F. BURGOYNE.

Colonel Harness, R.E., etc., etc.

Pall Mall, *15th March*, 1856.

MY DEAR GENERAL,

The kind terms in which you have communicated to me Lord Panmure's letter of yesterday's date will be always most gratefully remembered by me. I enclose a copy of my note to him, replying to the suggestion he has made, and trust you will consider that I have acted rightly in not at once acting in accordance with that suggestion, but in leaving it to the Minister for War to withdraw the appointment I hold from him by a formal act of his own, for to act otherwise would be an admission that the disagreement with Mr. Monsell, its continuance and consequences, are my fault.

I remain, my dear General,

Very sincerely yours,

H. D. H.

To General Sir John Burgoyne, G.C.B.,
etc., etc., etc.

Pall Mall, *15th March*, 1856

MY LORD,

Sir John Burgoyne has communicated to me your note of yesterday's date, suggesting the expediency of a change in my duties, on the ground of my disagreement with Mr. Monsell.

I received my appointment as the Senior Deputy-Inspector - General of Fortifications directly from yourself, and to your Lordship, therefore, I address my reply to that suggestion. Your note implies blame to me, and to resign on being so addressed will be to admit that I have done some wrong, which I do not admit.

I must, therefore, leave it to your Lordship to make

that change in your department which appears to you to be expedient.

I am, my Lord,
Your obedient servant,
H. D. HARNESS.

To Lord Panmure, etc., etc.

To the Secretary of State, War Department.

MY LORD,

I observe in the *Times* of this morning that notice of a question relating to my removal from the office of Deputy-Inspector-General of Fortifications has been given in the House of Commons, and I wish to state that I am in no way a party to that question.

I wish also to add that, while declining to resign because your Lordship's note to Sir John Burgoyne imputed blame to me, I agree with your Lordship that it is most inconvenient to the public since that Mr. Monsell and the Senior Deputy-Inspector-General of Fortifications should not be in confidential communication; and was perfectly willing to sacrifice my own position at your request, if the blame of the existing misunderstanding had not been attributed to me. My own feeling is that I have done more to remove that misunderstanding than ought to have been necessary.

An order for me to proceed to Malta has been sent by the Inspector-General from the Commander-in-Chief. Your Lordship must be aware that my removal from the office of Deputy-Inspector-General of Fortifications by a final act on your part is necessary to carry out this arrangement.

I have, etc., etc.,
H. D. HARNESS, Lieut-Colonel.

The Reply.

DEAR COLONEL,

I have received your letter, and I was quite sure that the question in the House of Commons was not originated by you. I have instructed Mr. Monsell how to reply to it. I can only regret that discussions between you have led to your pursuing the more active line of your profession, for I have the highest opinion of your abilities, though I have felt myself compelled, with due regard to the conduct of the public service, to part with you as a member of the Civil Department.

I wished your appointment to Malta to be officially known before that event occurred, in order to prove that

I had lost no confidence in your capacity as an Engineer officer of merited distinction.

I will now cause an official intimation to be conveyed to you, that you are relieved from the duties of Deputy-Inspector-General of Fortifications.

I am, yours faithfully,

PANMURE.

W.D., *April 1st*, 1856.

MALTA.—1856-7.

When Colonel Harness became Commanding Royal Engineer at Malta the defences of the island were still preserved on the same general plan that was constructed by the Knights of St. John three hundred years before. Some additions to the existing forts had been made since the British occupation of the island in 1801 to meet the increased power of guns, but they did not affect the general principle of the defensive arrangement, which was virtually that of the days of Vauban.

The lessons of the Crimean War, and the enlarged ideas resulting therefrom, were rapidly leading to the increase of the power of firearms of all kinds; and it was felt that in view of the growing power of large guns, a more extensive system of defence was required in an important naval and military station like Malta. The fact of the then Governor of the island, Sir W. Reid, being a Royal Engineer, caused the beginning of a movement in that direction, which eventually ended in the adoption of a totally new system for the defence of the island. A discussion ensued in 1856 between the Governor, the Inspector-General of Fortifications (Sir J. Burgoyne), and the Commanding Royal Engineer. Colonel Harness had thus a very important question immediately thrown upon his hands. The Governor naturally gave considerable weight to the requirements of the Maltese population, whilst Colonel Harness considered the question mainly from the point of view of the naval and military requirements of the ruling power in that part of the world. The correspondence between the three authorities resolved

itself partly into a discussion on the occupation of such places by a great maritime power ; and a very interesting and important one it was, considering the number of such positions held by Great Britain in various parts of the world, and the high characters of those who took part in it. It is not, however, one that can as yet be properly published.

Colonel Harness took into consideration the number and character of the population of Malta as one of the important elements of the subject. The first has greatly increased since the British rule began in 1801, owing to their peaceful and prosperous time ; especially in the town part within the fortifications, which has become densely crowded. Hence, the inclusion of a large population within the fortress, always a difficult matter, became a much more serious one than in most other cases. Colonel Harness pointed out the peculiar difficulty of it, owing to the circumstance that the Maltese, however well disposed to our rule, have little interest in the naval and military operations of the ruling power.

The final plan of defence was arrived at from consideration of the necessity of protecting the dockyard and naval arsenal from bombardment by the very large guns now carried on board warships. That protection on the sea front could only be effected by placing equally powerful, or more powerful, guns in defensive positions at suitable points ; but as it was practicable to land heavy guns on the east coast, and possibly on the south coast, and so get within range of the dockyard, it was decided to occupy the island with defensive posts in such positions as would prevent any such landing, and these works have since been carried out.

CHAPTER VI.

THE SUPPRESSION OF THE INDIAN MUTINY.

By MAJOR-GENERAL WEBBER, C.B., R.E. *

THE portion of the life of Sir Henry Harness which was spent in India is of special interest to his Corps, not only on account of the great national importance of the events in which he took, more or less, a prominent part, but because their effect on the Corps of Royal Engineers resulted in the gradual extension of its sphere of employment over the Indian Empire, by which the East India Company's Corps of Military Engineers for the three Presidencies have in forty years gradually disappeared as distinctive cadres.

In the active life of the Mutiny campaigns, and in the views he expressed on the subject of what might be called the amalgamation of the Corps and of their duties and the influence of those views on the actual results, there is fresh opportunity of studying the varied character of the man, and the freshness of his mind and body, after many years' hard work in the public service.

In July, 1857, it was rumoured that four companies of Royal Engineers were to be held in readiness to embark for

* In 1897, I was asked by General Collinson to undertake the compilation of this chapter. It had been already in the hands of Sir Wilbraham Lennox and Sir E. Thackeray, but of the labours of neither of these writers have I been able to make any use.—[ED.]

India, and on the 3rd September the Deputy-Adjutant-General, R.E., wrote to Colonel Harness, who was then stationed at Malta :—

Horse Guards, 3rd September, 1857.

MY DEAR HARNESS,

Four companies are to go to India. I have sent in your name as C.R.E. to go overland.

. . . much dislike to send any officer of your rank. I persisted in your going, but you are not actually appointed, and I will write again by first opportunity.

Yours very truly,
J. W. GORDON.

This was followed by one more from Sir John Burgoyne, the Inspector-General of Fortifications, dated the 16th September, 1857 :—

War Office, Whitehall,
16th September, 1857.

MY DEAR HARNESS,

I hope your nomination to service in India will be agreeable to you. I remember your expressing an earnest desire to go to the Crimea, and India is now the field that all ardent spirits are at this moment striving for. Our desire has been to avoid sending out a certain number of companies of sappers to act entirely a subordinate part under the Company's Engineers, and consequently we are fighting to obtain a proportion of Engineers of standing and of reputation, that we may bear our part in the responsible proceedings and not be entirely subordinates.

As regards yourself, I believe no dissent has been offered by any of the authorities, but I may tell you frankly that I expected that there possibly might have been, for there is a delusive folly abroad, that officers who have been distinguished for service and knowledge have *necessarily*, as is thought, a deficiency in the qualifications of a soldier for the field, to enable them to take the command of troops as may be required of them in field service. I have always resisted such a notion, and maintained, on the contrary, that to such men the strictly military proceedings would be child's play.

Yours very faithfully,
J. F. BURGOYNE.

Also the three following letters from Sir William Gordon :—

Horse Guards,
21st September, 1857.

MY DEAR HARNESS,

I hope passage will be provided for you as herein demanded. Instructions will be sent you. Captain Fenwick, the next senior officer who goes to Bombay, is, I believe, a good officer. . . .

The S. of S. for War has struck out a second F.O., and four First Captains out of the "detail for India." "Engineer Field Officers," he says, "are expensive toys." Sir John will not fight Lord P., and I never go near him. My master, the Duke, behaved very kindly, listened to a long story in defence of our Corps, and he recommended a proper staff and a proper number of officers of rank. I must get at the Queen if I can, for Lord P. keeps us down unfairly.

Fenwick in conversation said to me: "Harness will remain at Calcutta, and I will proceed to Delhi and join Sir Colin Campbell." I told him it was not customary for the C.R.E.'s to remain behind when the Commander-in-Chief took the field. Of course, Fenwick will have to report home direct unless his force comes to your Presidency. You will be the only C.R.E. in India, I think, but orders will be sent by the steamer of the second. Sappers and all go as passengers in plain clothes through Egypt.

Yours very truly,
J. W. GORDON.

Horse Guards,
September 20th, 1857.

MY DEAR HARNESS,

Your order has been long in being sent. After receiving it, and after learning that of the four companies ordered on service for India, two were to go to Calcutta and two to Kurrachee, I applied for additional officers of rank above Second Captain. The Duke approved, but Lord Panmure refused. I must send instructions about duties; but the "Kurrachee party" will report direct to London, unless the two parties come into the same province, when the senior will take command. Captain Fenwick commands for Bombay. No adjutant allowed you as an Engineer Adjutant, only a sapper one.

I am sorry we have been cut down so low in officers

and staff, but this matter has been ordered by Lord Panmure.

I will remember your information, of a company being available for Malta. You will, of course, have to prepare for the arrival of the Engineers. No orders up to this time respecting their departure. All are in readiness.

Yours very truly,

J. W. GORDON.

Horse Guards,

October 1st, 1857.

MY DEAR HARNESS,

I enclose a memorandum relative to officers commanding. Of course, it must be subject to orders from the Commander-in-Chief in India.

I think you have good officers and men sent to you. Probably the China Company, the 23rd Company, you will find in India. They have been landed at Singapore. Captain Cox is appointed your Adjutant, Lieutenant Beaumont your Quartermaster. Cox may be detained by a court martial. He is a good officer, and he will specially keep all military and sapper matters straight. Beaumont has not been brought up in military matters at all. He is an officer of great ability, especially in all mechanical applications. I hope you will find him useful in all matters where mechanical appliances under difficulties are wanted. I know how desirable it is to have an *officer*, and not a N.C. officer as Quartermaster, because *personal application* is required to obtain a share of things. If Beaumont can be made a D.A.Q.M.G., then I think a N.C.O. might be promoted Quartermaster.

I am truly sorry that the Secretary of State for War has struck out the First Captains. His action on our Corps is baneful to it.

Of course, you will write officially about all wants, officers included, as you find necessary. I will fight for you at the Horse Guards, but I do not go to Pall Mall. I hear Hallewell goes to Suez with you. Please remember me specially to him. To Captain Peel, R.N., also, if you meet him, please say that I have read every line about him with the deepest interest.

Tell him that, situated as I am now, my duty is to send the best officers I can find to co-operate with him; and as I know some much better than myself, I fear that I shall not have the great honour of being side by side with him in the hour of battle once more.

Let me impress on you the necessity for keeping a regular journal, and transmitting a copy of it from time to time. This is the age for reports and book-writing with illustrations, and you must begin from the very beginning with the impression that the Engineers will be engaged in operations of interest, and that an account of their whole proceedings will then be called for.

Yours very truly,

J. W. GORDON.

The following is a list of the officers and companies of the Royal Engineers who actually landed in India for employment in the suppression of the Mutiny :—

Staff—Colonel Harness, Commanding R.E. in India.

Captain Fenwick, commanding R.E. in the Bombay Presidency.

Captain F. E. Cox and Lieutenant F. Beaumont, respectively Adjutant and Quartermaster with the Commanding Royal Engineer.

4th Company.—Major L. Nicholson; Lieutenants P. H. Scratchley, C. E. Wynn, W. Keith.

11th Company.—Captain C. E. Cumberland; Lieutenants J. R. Maquay, D. C. Walker, J. B. Paterson.

21st Company.—Captain Fenwick; Lieutenants J. B. Edwards, W. B. Gossett, C. E. Webber, E. R. Festing.

23rd Company.—Captain A. G. Clarke; Lieutenants W. O. Lennox, E. D. Malcolm, G. D. Pritchard.

The 23rd Company was on its way to China, forming part of the military expedition to that country, and in common with some other portions of the same force was stopped at Singapore and despatched to Calcutta.

The 4th and 11th Companies left Chatham on the 2nd October for Southampton, where they embarked the same day on board the P. and O. steamer "Sultan," which touched at Malta, where Colonel H. D. Harness joined the ship which proceeded to Alexandria, which place she reached on the 15th.

On the 16th the Egyptian flag was saluted by a frigate, and our British sappers (the pioneers on this route), clothed in the garb of peaceable English husbandmen, *i.e.*, white blouses and wideawakes, landed.

At 5 p.m. on Sunday, the 18th October, Colonel Harness addressed the men in a few manly heartfelt words as to the nature of the service rendered by the Pasha of Egypt to our gracious Sovereign, by allowing British troops to traverse his territory, and expressed the confident hope that no complaint would be brought against them for violation of hospitality.

ROYAL ENGINEERS.

Horse Guards,

30th September, 1857.

Memorandum for the Guidance of Officers in command in India.

1. The senior officer of Royal Engineers in India will be "Commanding Royal Engineer in India," and no other officer will assume the title of "Commanding Royal Engineer."

His station will be with the headquarters of the army.

2. The senior officer in each of the other Presidencies will assume the title of "Commanding the Royal Engineers (Bombay) or (Madras) Presidency."

3. All Royal Engineers in India will be under the command of the "Commanding Royal Engineer," and the officers commanding in the Bombay and Madras Presidencies will transmit to him such periodical states, returns, and reports, as he may call for. The Commanding Royal Engineer must at all times be kept fully informed of the strength, position, and operations, of the Royal Engineers, wherever employed in India.

4. Officers commanding in the Bombay and Madras Presidencies, so long as they are employed in their own Presidencies, or at a great distance from the "Commanding Royal Engineer," will transmit their usual returns direct to the D.A. General R.E., and they will also make reports direct to him on military matters. They will transmit to the Inspector-General of Fortifications, from time to time, reports, by which he will be informed of the nature of the duties on which the Engineers are employed. They will send copies of such reports to the Commanding Royal Engineer in India.

In the event of the post of Commanding Royal Engineer being vacant, the senior Royal Engineer officer at headquarters will report the circumstance to the Commander-in-Chief, and he will give into him the name of the next senior officer in India. The Commander-in-Chief, during war, will doubtless order that officer to headquarters; but during peace he may possibly cause his name to be entered in General Orders, as temporary Commanding Royal Engineer, without requiring him to join at headquarters.

The officer so named in General Orders will hold the temporary command, either till he is confirmed from home, or till the arrival of the officer appointed Commanding Royal Engineer by H.R.H. the General Commanding in Chief.

By order of the I.G.F.,

(Signed) W. GORDON, Colonel,
D.A.G.

We now extract from Colonel Harness's own notes of daily events :—

On the 19th October, 1857, arrived at the end of the completed portion of the railway by 6 a.m., from whence the party were forwarded in three divisions, at intervals of four hours, over the remaining distance (twenty-five miles) to Suez, in vans containing six each. The first of these divisions had reached Suez, and been conveyed from thence to the steamship "Nubia" by half-past 12; the second division reached that ship about 5 p.m., and the third between 9 and 10 p.m.; and as the "Pekin" was not ready to receive the officers and men intended for Bombay, the whole remained on board the "Nubia."

And, on the 20th we find the following :—

Being applied to by the agent of the Peninsular and Oriental Company to sign the certificate of the embarkation of the troops on board the "Nubia," Colonel Harness made a memorandum thereon to the following effect :—

"I do not know the terms of the contract under which these troops are embarked, but consider it to be my duty to state that they are accommodated wholly on the deck; and that for so long a period as that required for the voyage to Calcutta, this, if the weather prove unfavourable, may be injurious to the health of the men.

“ My servant is accommodated as a second-class passenger.”

The “ Nubia ” reached Aden on the 26th, and Galle on the 5th November, Madras on the 8th, and on the 12th Calcutta.

In reporting his arrival to the Horse Guards, the effects on the health of the rank and file, as testified by Staff-Surgeon Hewett, through which Corporal Gidley died, and cases of diarrhœa and liver and ophthalmia occurred, caused by exposure on deck at night, were described.

On the 13th November he landed, and immediately applied to Sir Richard Garrett, the General Officer Commanding in Calcutta, for land transport for himself and one officer to the headquarters of the army in the field.

On the same day he was informed that the Government of India was sending instructions to Galle that the 10th Company (Captain Fisher, R.E.), on its way to India by the overland route, should be diverted to China.

Before starting for the front he published an order from which the following are extracts :—

1. The Commanding Royal Engineer is gratified by being able to record, in the first order issued by him in this country, his satisfaction with the conduct of the two companies of Royal Engineers during those portions of the voyage to India for which they were respectively under his observation.

2. Major Nicholson will keep the 4th Company in readiness to be moved at the shortest notice wherever it may be ordered, ascertaining that it is in every respect complete in equipment, including ammunition, under the existing regulations for troops *en route* in India.

3. Lieutenant Scratchley, R.E., will hold himself in readiness to proceed to headquarters with the C.R.E.

4. Lieutenant Beaumont, R.E., will remain at Calcutta until further orders, to take charge of all stores which may arrive there intended for the Royal Engineers ; and to organise, or assist in organising, such Engineer equipment as he may receive instructions to prepare at Calcutta.

5. On the arrival of Captain Cox, R.E., Lieutenant Beaumont will inform him that it is the desire of the C.R.E. that he shall take the necessary steps for

proceeding to the headquarters of the army as quickly as possible.

On the 24th November, the C.R.E., with Lieutenant Scratchley, arrived at Cawnpore, and finding it impossible to proceed further without an escort, he reported his arrival by letter to Sir William Mansfield, chief of the staff.

On his arrival, an A.A. General's minute, dated Chatham, 1st October, 1857, was handed to him by Major Nicholson, R.E., confirming acting promotions amongst the N.C. officers in India that had been made by him.

On the 25th November, in Colonel Harness's diary, we find the following entries :—

The C.R.E. heard that it was the intention of Major-General Wyndham, commanding in Cawnpore, to attack on the following day the Gwalior contingent, which had crossed the Jumna at Calpee and advanced to Suchandee, if any part of that force crossed the Pandu Nuddy. He therefore requested the Major-General to allow him to attach himself and Lieutenant Scratchley to the staff if such encounter occurred, and permission being given, these officers went out in the evening to the camp near the crossing of the Calpee and Cawnpore road over the Ganges Canal.

On the 26th.—Soon after daylight the Major-General, having directed the camp to be struck and all baggage moved to the rear, advanced with his staff, about forty or fifty irregular horse, and half-a-dozen of the 9th Lancers, to ascertain the enemy's position. He found that a considerable portion had passed the Nullah, and were on and to the right and left of the road, at about two miles from the canal. He therefore determined to attack them with the force in his camp, comprising the 88th, 34th, and 82nd Regiments, and about 200 of the Rifle Brigade, together about 1,700 men. He advanced with this force in skirmishing order, the Rifles on the right, when it was soon apparent that we overlapped the enemy's left. The ground was nearly level, but covered either with wood or high cover to a great extent, and except on the occasion when the left of the enemy was seen, he was rarely perceived during the day. He fired quickly against our men as they advanced with shot, shells, and grape, but being rapidly pressed by the skirmishers, retired, leaving two 8-inch howitzers and

one 6-pounder in our hands, which were taken to Cawnpore. Having forced the enemy to continue his retreat about a mile beyond the point (about a quarter of a mile to the westward of the Pandu Nuddy) where the guns were taken, the Major-General considered it imprudent to remain at so great a distance from Cawnpore, and withdrew his men to a camp about half-way between the former camp and the town. The enemy followed this retreat, and fired occasionally from a long distance upon the rear guard; he also advanced as far as the canal and drove back the picket left upon the bridge.

27th November, 1857.—Early this morning preparations were made for renewing the attack if necessary, but the information received induced the Major-General to return to Cawnpore, under the impression that the enemy's advance was checked. Shortly after, however, further information produced a contrary opinion, and on again reaching the camp, about midday, he went with a few cavalry and his staff to look for the enemy, who shortly after began firing in front of our left, but at so great a distance that no shots were seen.

This decided our advance, but it soon appeared that the enemy was in great force, occupying a front of three or four miles: his left advancing by the Bithoor road, his right being near the canal and his artillery numerous. Five pieces of Madras artillery were therefore placed across the Bithoor road, about a mile in front of Cawnpore, and the line gradually retired to occupy a line between a point on the canal, about three miles from its junction with the Ganges, and the five guns above mentioned; on a part of which line a number of mounds of refuse bricks and brick dumps offered some strong points for defence. It is probable this line would have been maintained, but a report reached the Major-General that the enemy had turned the left in force, entered the town, and would soon be in possession of the fort and entrenchments. Under this impression the line was ordered to retire, and the order had been acted upon before the mistake was discovered. The troops retired within the entrenchments that had been prepared during the previous month in front of the small earthen fort of Cawnpore.

The C. R. E. considered it right under the circumstances to request the approval of the Major-General to his visiting these entrenchments with the Engineer officer who had charge of them, and without interfering with that charge to make himself acquainted with their state

of defence ; and with the approval of the Major-General, he accompanied Major M'—, of the Bengal Engineers, round them.

The fort of Cawnpore is an earthen redoubt of very irregular figure, but generally of good profile. The Ganges being considered its rear, its right is about fifty yards below the bridge of boats, and its left about 200 yards from the canal. In the latter direction it has been extended about 100 yards, partly by earthen works, but chiefly by a weak palisading only, which is not continued to the river, nor is this additional part enclosed on the side next the river. The river face also of the principal part of the work is so defective that it is by no means secure against immediate assault on that side ; and as the river banks are unseen from the works, the approach to it would be easy for an attacking force. This latter defect is met in the entrenched position taken up, by occupying the bungalow, *a**, which rests on the river bank, and while held could effectually check troops passing below it. This bungalow forms the right of the entrenched position ; the left is a bungalow, *b*, on the opposite side of the canal, about 200 yards from it, and near, but not as immediately upon the river as that on the right. Between the flanks some simple detached works, *c*, *d*, *e*, open in rear, of slight profile, and rarely presenting any ditch, have been formed. Against European troops the works could offer but a feeble resistance, as they could easily be approached under cover on the right by a large force, and the impediment to an assault is in many places insignificant. It has been assumed in the design that the natives will not assault entrenchments, however slight ; and there is no possibility now of executing works to strengthen them.

28th November, 1857.—Soon after midnight the C.R.E. was sent for by the Major-General to meet other senior officers of the forces, whose opinions, with respect to two courses of action based on the information he then had, he wished to obtain. One was to march during the night, and to hold certain advanced posts at a sufficient distance to prevent, while held, the fort from being shelled. The other, to march during the night to the right of the enemy, where it was believed his guns were concentrated, and attack him just before daybreak. The opinions given were in favour of the latter course ; but when further information arrived during the night, it appeared that the guns were spread over the whole line,

The reference sketch is not forthcoming.—Ed.

and that no great number could be captured by the proposed operation. The course adopted by the Major-General was to advance the Rifles against the right of the enemy on the north side of the canal, with four 9-pounder guns under Captain Green, R.A., the 34th, 64th, and part of the 82nd, with some Madras field guns, against his left on the Bithoor road, and to place the remainder of the 82nd in a strong building between these two bodies for their support and connection. In the execution of this, the Rifles drove back the enemy and took two long 18-pounder guns, which were brought into the fort. On the right, no permanent impression was made, and in an advance the 64th Regiment lost four of their officers, including their colonel and major. In the evening the whole again withdrew into the entrenchments.

The Commander-in-Chief arrived on the opposite bank of the Ganges during the evening.

29th November, 1857.—The enemy fired frequently into the entrenchments during the day. In the morning the Commander-in-Chief sent the 93rd Regiment and part of the 53rd across, and several guns. During the afternoon, the baggage, the women, and the sick and wounded from Lucknow began to cross over. The colonel of the 64th was buried in the fort at 9 a.m.

The promotions in the 23rd Company to succeed Colour-Sergeant Moorant, killed in action, were this day confirmed, and reported to the D.A. General, R.E., London.

30th November, 1857.—The baggage continued to pass, and the whole of the baggage, troops, etc., had not crossed until 6 p.m., having required twenty-eight hours to cross the bridge. The force brought by the Commander-in-Chief, and those convoyed by it, were established in a camp to the left of our position, and more than a mile beyond the canal.

The enemy frequently fired into the fort.

1st December, 1857.—As yesterday, the enemy frequently fired into the fort, and occasionally into the camp of the Commander-in-Chief. Guns were placed in several advanced positions to reply to them, and a good deal of musketry fire was exchanged with the outposts.

2nd December, 1857.—About 2 a.m. Lieutenant Lennox came to the tent of the C.R.E. with a message from the Commander-in-Chief to the effect that he wished the fort to be put into such a state as would enable it to be self-

defended after the withdrawal of the force now garrisoning the advanced entrenchments. The C.R.E. went round the fort with Lieutenant Lennox and pointed out the defects to be remedied and small additions made. At 8 a.m. he went to inform the Commander-in-Chief, but found that by a note just finished for him the desire was to strengthen and alter the works to the extent requisite to render them tenable by 1,000 men, inclusive of artillery. The C.R.E. directed the working parties applied for to be employed round the fort while he considered what would be necessary in the extensive works to enable their garrisons to be largely diminished. He found the garrisons of two of the posts, *c* and *d*, excessive, and that all might be diminished; and that by giving a small redoubt of strong profile to each of the large advanced entrenchments, a few men in addition to the proper garrison of that redoubt would be sufficient, and 1,000 men enough to hold the whole of the present lines. This view he endeavoured to act upon, and partially did do so, but his acknowledged position made it difficult to carry out his views, with an officer of Bengal Engineers in charge of the works: the latter being apathetic when the views of the C.R.E. were not in accordance with his own. Yet circumstances rendered it very inexpedient to press the Commander-in-Chief for the proper notification of the C.R.E. in General Orders.

3rd December, 1857.—The same as yesterday. Some shots came into the fort—some into the camp of the Commander-in-Chief—some firing between the pickets at all times.

4th December, 1857.—The enemy during the night sent a fire-boat adrift in the stream. It was stopped before it reached the bridge by a N.C. officer and some men of the 64th, and scuttled near the post held by them. Reports that the enemy had crossed into Oude with a quantity of baggage during the night. The firing much diminished.

5th December, 1857.—In the middle of the day, news having arrived that the enemy were moving to threaten our left, the troops were put in motion in that direction, and a cannonade continued for about an hour on the left. An order of the Government received, stating that Dumdum, or Barrackpore, would be the headquarters of the R.E. and R.A.

6th December, 1857.—The tents were struck at 7 a.m., and about 9.30 a.m. the troops were in motion to attack and turn the enemy's right. The entrenched position

closing our right on the Ganges, our force was extended so as to press his front at the same time that it overlapped his right; about half the cavalry and a battery of horse artillery being detailed to cross the canal by a bridge to the left of our position, to make the turning of the enemy's right more effectual. The enemy gave way at all points. The only check to the advance was for a few minutes at the canal bridge crossed by our left (within the cavalry force which crossed by a bridge yet further to the left); after this it was a continual pressing forward as fast as the men could move, and a continual surrender on their side. Fourteen or fifteen guns, including five howitzers, a large quantity of ammunition, and all their camp was taken; and the cavalry coming round upon them when beaten sabred a large number.

7th December, 1857.—Inspection showed that the enemy had abandoned the town and its neighbourhood. The camp was moved to the immediate vicinity of the enemy's abandoned camp, about two miles in front of Cawnpore.

In Major-General Wyndham's despatch dated 30th November, he refers to Lieut.-Colonel H. D. Harness, commanding Royal Engineers (as well as Major-General Dupuis, commanding Royal Artillery in India), in the following terms:—

“I therefore hope I may be allowed to thank through your Excellency the undermentioned officers for the great services they have voluntarily rendered me during this trying time.”

In his despatch dated 10th December, 1858, Sir Colin Campbell referred to the subject of our Memoir in the following way. After mentioning Major-General Dupuis, commanding the Artillery during the action, as having been accidentally present in the camp, he wrote:—

“Colonel Harness, Royal Engineers, was also present in the same manner, and accompanied me throughout the action.”

On the 8th December Colonel Harness received a General Order dated the 7th, informing him that the Governor-General in Council had decided that the headquarters of the Royal Artillery and Royal Engineers “shall be at the Presidency,”

and directing Major-General Dupuis, R.A., and him to proceed to Calcutta.

Sir Colin Campbell at the same time offered his thanks :—

His Excellency offers his thanks to Major-General Dupuis, C.B., Royal Artillery, and to Colonel Harness, Royal Engineers, for their cordial readiness to assist him in the operations of yesterday.

From Benares, where he arrived on the 16th December, Colonel Harness wrote, as follows, to the Deputy-Adjutant-General, Royal Engineers :—

SIR,

It is my duty to report the circumstances under which I have left the headquarters of His Excellency the Commander-in-Chief while he remains in the field.

On arriving at Calcutta on the afternoon of the 12th ult., I called on Major-General Sir R. Garrett to report my arrival, and to request to be forwarded without delay to the headquarters of the Commander-in-Chief, then supposed to be before Lucknow, and not finding him at home, left for his information a copy of your letter of the 19th September, 1857, notifying to me my appointment as Commanding Royal Engineer, together with a copy of your memorandum of the 30th September, 1857, under the first paragraph of which it was my duty to proceed to headquarters. The arrangements for my being forwarded thereto were made in consequence without delay, and in accordance therewith I left Calcutta with Lieutenant Scratchley, R.E. on the evening of the 16th ult.

On the morning of the 24th ult. we reached Cawnpore, and finding it impossible to proceed further, I addressed the letter (24th November, 1857), of which a copy is annexed, to Major-General Mansfield, chief of the staff.

On the afternoon of the 28th the Commander-in-Chief arrived with the force that had returned with him from Lucknow, on the left bank of the Ganges. Late in the evening he crossed to the entrenchments held by us on the right, or Cawnpore side, and I waited on him there. He afterwards returned to his camp on the opposite bank.

The following day, about noon, I waited on His Excellency on the opposite shore, and in reply to the inquiries of the chief of the staff, informed the latter of

the nature of my position, and of the letter written to him on the 24th ult., which had not yet reached him.

The next morning, the 30th ult., I waited on the chief of the staff with a copy of my communication of the 24th ult., who had in the meantime received the original. He told me that if I had reported my arrival, orders would have been sent to me to remain at Calcutta, where the Adjutant and Quartermaster - General and other officers of the headquarters staff had been directed to remain ; that he would lay my letter before the Commander-in-Chief, and that I should receive instructions.

Feeling very apprehensive from the manner of this communication that these instructions would be to return to Calcutta, I expressed my intention, in a case so important to my character as an officer, to see His Excellency myself upon the subject, which I did a very short time afterwards. He admitted that I had acted properly in obeying promptly on my arrival the orders received by me from the proper authorities at home, and while dwelling on the embarrassment of a large headquarters staff, and on the fact that the staff with him was only that of a division to which he had temporarily attached himself, he gave me reason to believe that as I was with the army I should remain with it ; and almost immediately after this I informed General Mansfield that my interview with the Commander-in-Chief had been satisfactory on that account.

This impression, however, did not long continue. I was soon informed that a telegram message had been sent to the Governor-General to ascertain the headquarters of the Royal Artillery and Royal Engineers ; no notification of my joining the army was made in General Orders ; and an order of the 16th November, 1857, by which Lieutenant Lennox, of the Royal Engineers, was appointed to command the Engineer force with the army, the men of the Royal Engineers being also brigaded with the sappers in the Company's service under his orders, remained unaltered.

So long as the order for my withdrawal from headquarters was deferred, I took every proper opportunity to urge upon His Excellency the painful position in which such an order would place me ; to repeat to him that I was no greater encumbrance to his army than an additional subaltern must be whose presence he would object to ; and that I hoped to be able to render services equivalent to that encumbrance. But after the order appeared, I ceased to remonstrate and took, in concert

with Major-General Dupuis, R.A., the necessary steps to obey it. We left the camp at Cawnpore on the morning of the 12th inst. ; and I write this report from Benares, while *en route* to Calcutta, that it may be more certain to proceed by the next mail than if delayed until my arrival at the latter place.

I need hardly point out to you that my presence at Calcutta to organise a headquarter establishment is unnecessary. That my administrative duties with so small a force, with no works in progress under my charge, with both the companies of Royal Engineers in this Presidency attached to the army in the field, must be insignificant. That unless required, and able to be of use as a military Engineer, and employed to direct that department of the army, which I cannot do unless by the side of the Commander-in-Chief, I have no useful position in this country. I presume that it will not be thought right to leave me in this equivocal situation.

A copy of this communication was forwarded at the same time to Sir William Mansfield, chief of the staff.

Captain F. E. Cox, R.E., who had been appointed Adjutant to Colonel Harness, had been detained on court martial duty in England, and only arrived to meet his C.R.E. at Benares, who gave him a letter with which to proceed to headquarters, to the chief of the staff, recommending his employment.

The following letter from Colonel Harness to Sir Colin Campbell is descriptive of the result :—

Calcutta,

MY DEAR SIR,

1st January, 1858.

The personal intercourse with which you favoured me while allowed to remain with your camp has left so kindly an impression that I do not hesitate to write to you on a subject which gives me, if possible, even more pain than my own return to Calcutta.

I left orders in Calcutta that Captain Cox, R.E., who had been appointed in England to be the Adjutant to the Royal Engineer Force for India, should follow me to the army directly he landed. I met him on my way down, at Benares, acting on that order, and directed him to proceed and to report himself to Major Nicholson, R.E., giving him also a note to Major-General Mansfield, explaining my reason for sending him forward.

You will perhaps remember my having mentioned to you the unfavourable position in which the two able young officers attached to me would be placed by my removal from headquarters, and my wish to send them forward. The impression left on my mind was that I might act as I pleased with respect to them. I can hardly express the pain it has given me to learn that Captain Cox has been ordered, on arriving at Cawnpore, to remain there, and not to proceed with the Royal Engineers attached to your force.

The officers of Royal Engineers have abundant opportunities to learn their garrison duties, and to acquire experience in the construction of barracks and works ; while their opportunities for seeing troops in a campaign are so limited that it is the duty of the senior officers of the Corps to do their utmost to obtain opportunities for its younger members to acquire such experience. It is not only due to them individually that we should do this, but it is also for the good of our country.

I shall esteem it a personal favour, if you will allow me to take the liberty to ask one, that, Captain Cox shall be permitted to join that part of his own Corps now doing duty with your army.

Believe me, my dear Sir,
Very faithfully yours,
H. D. HARNES.

H.E. Sir Colin Campbell, G.C.B.,
Commander-in-Chief, etc., etc., etc.

Colonel Harness having sent Captain Cox, R.E., from Benares to army headquarters, the following correspondence referred to, as follows, took place :—

No. 11. Calcutta,
14th January, 1858.

To Colonel Gordon, C.B.,
D.A.G., R.E.

SIR,

I have to report the following circumstances in continuation of my letters of the 16th and 21st ult. (Nos. 4 and 6).

Before leaving Calcutta on the 16th November, I left orders that Captain Cox, the Adjutant appointed to serve with the Royal Engineer Force in India, should on his arrival follow me to headquarters ; and when returning, I met him at Benares proceeding to join me in compliance with that order. I then directed him to continue his

journey, and to report himself to Major Nicholson, R.E.; both the companies of R.E. in the Bengal Presidency being at headquarters, and also all his brother officers, except Captain Clarke, who was lying wounded at Allahabad, Lieutenant Beaumont, whom I had ordered to remain at Calcutta, and myself. I also gave him, on the 16th December, 1857, a note to Major-General Mansfield, the chief of the staff (of which a copy is annexed), explaining my reasons for sending him forward.

Soon after my arrival in Calcutta I received a letter, dated 25th December, 1857 (a copy annexed), from Captain Cox, forwarding to me a copy of a G.O., by which he was directed to remain at Cawnpore. Anxious that Captain Cox should see service with the force in the field, for which purpose only I had allowed him to proceed from Benares, I, on 1st January, 1858, addressed a private note, of which a copy accompanies this, to His Excellency, the Commander-in-Chief. Copies of the reply, 6th January, 1858, received from the chief of the staff, and of a letter, 12th January, 1858, since written by me on this subject, are also forwarded. No comment of mine on either of those documents can be necessary.

It did not appear to me to be an act of much importance, nor requiring much consideration on the part of an officer of more than thirty years' service, and holding the position of C.R.E. in this country, to order one of his officers who had arrived at Benares, to continue his journey to headquarters, where the whole of his Corps in the Presidency, with the few exceptions above mentioned, were stationed; especially when to remove any difficulty, if such there could be, an explanatory letter was given to him for the chief of the staff. Nor, when no reply was received to that letter, and the wish expressed in it was found not to have been complied with, for the C.R.E. to communicate on the subject directly with his General (with whom it is natural to suppose his direct and confidential communication would be habitual). But, however this may be, I am confident that nothing on my part justifies the discourteous letter addressed to me on the 6th inst. by the chief of the staff; and I trust that H.R.H. the Commander-in-Chief, and the Secretary of State for War, under whose orders and authority I have come to this country, will concur in that opinion and give me their support.

My own feelings would undoubtedly prompt me to

apply for leave to return to Europe, for all hope of rendering any useful services with the army is gone. But on considering the form of my appointment as C.R.E., it does not appear to me that I should act rightly in taking any steps to expedite my departure from India before receiving instructions from England.

I am, Sir, your obedient servant,

(Signed) H. D. HARNESS,
Col., C.R.E.

To Colonel Gordon, C.B.,
D.A.G., R.E.

Fort Cawnpore,
25th December, 1857.

SIR,

I have the honour to forward herewith a copy of the order which was handed to me on the evening of 23rd inst., and in compliance with which I yesterday returned to Cawnpore and reported myself to Major Mcleod, Bengal Engineers.

I have the honour to be, Sir,

Your obedient humble servant,

(Signed) F. E. Cox,
Captain and Adjutant, R.E.

Colonel Harness, R.E.,
C.R.E. in India.

Extract from General Officer by His Excellency the Commander-in-Chief.

Headquarters' Camp, Cawnpore,
23rd December, 1857.

No. 6. Captain F. E. Cox, R.E., now at headquarters, is directed to remain at Cawnpore, for the purpose of assisting in the works now in progress at that place under the orders of Major Mcleod, of the Bengal Engineers. True extract.

(Signed) GEORGE E. WATSON, Lieut.,
Major of Brigade.

Headquarters' Camp, Futtegurh,
6th January, 1858.

SIR,

I have the honour to inform you, by desire of the Commander-in-Chief, that it has appeared necessary to His Excellency to make your communication of the 1st January, 1858, official.

It is a matter of great regret to His Excellency that Captain Cox, of the R.E., should have been put to inconvenience ; but he is compelled to remark that that has happened in consequence of an unauthorised proceeding on your part.

Captain Cox, as your Adjutant, is bound to remain attached to you. If he fail to do so, he sacrifices a very considerable amount of monthly allowances. He is, therefore, at this moment deprived of his rightful emoluments, owing to the step you have been pleased to take. All this would have been avoided if you had made a communication to me by telegraph, of Captain Cox's arrival at Benares. You would in such case have been instructed on the usage and regulations of the service of this country, and Captain Cox would not have been inconvenienced.

It was too late to remedy the error which had been committed when Captain Cox arrived in His Excellency's camp. At that time there was a superfluity of Engineer officers already for the operations held in view by His Excellency. A very large augmentation of Engineer officers was, besides, expected to arrive with a column from the north-west which has since joined. You appear to forget that there are other officers besides those of the R.E. in this country, and that His Excellency alone is able to judge of the requirements of the service in the various parts of it.

You remark, in a manner not agreeable to His Excellency, on the employment assigned to Captain Cox, instead of allowing him to pass a life of idleness in this camp. It is evident that you totally misappreciate the important service he is able to render, in completing the defence of Cawnpore, under Major Mcleod, of the Bengal Engineers.

You also undervalue, in a remarkable degree, the opportunity afforded of learning to make himself useful in a country new to him, although you should be aware that the capabilities of a subordinate Engineer officer are very limited until he is able to work with the natives and to address them in their own language. When the officers of your department are able to do this, they will be of great service to the Government. As His Excellency desires to avoid irritation as much as possible, I have been desired to give this full explanation. But it is necessary, on account of discipline, to call your attention to the professional error you have committed in giving an officer orders to proceed on a journey without

the sanction of superior authority. It is in the power of no one to do so but the Commander-in-Chief. The orders of the Commander-in-Chief for such purposes can only be obtained officially, as the execution of them involves expenditure on the part of the State.

It is probable that the expense of Captain Cox's journey back to Calcutta will fall on himself, as it is impossible to say that he arrived at Cawnpore by His Excellency's orders.

His Excellency further requests that whenever you have to address him on such topics in future, you will not write to him personally, but follow the usual channel of correspondence through the Adjutant-General, Her Majesty's Forces.

I have the honour to be, Sir,
Your most obedient servant,
(Signed) MANSFIELD, Major-General,
Chief of the Staff, East Indies.

[Private.]

War Office, Whitehall,
13th March, 1858.

MY DEAR HARNESS,

I have been greatly distressed by the unworthy position in which you have been placed without any fault or error on your part. But your Bengal tigers are somewhat overbearing, and there is a difficulty at this distance, and under the present public prestige in their favour, in restraining them in any degree.

Colonel Gordon will have sent you copies of the memorandum which I have submitted to the Commander-in-Chief on the subject, but all I can hope for is to impress upon H.R.H.'s mind the true view of the case, for he does not feel it to be a case for direct interference yet; my object is, however, to get you relieved from your position, if they cannot make it what it ought to be. The Duke has thought it right to consider you were in error in sending Captain Cox up to the army or disposing of your officers without the sanction of the General in command. On that point, I have explained that I was sure that you never for an instant assumed such a *right*, but that you had merely anticipated what you thought Sir Colin would not object to; the only pity is that you grounded the act on the benefit it would be to that officer, instead of stating, as I am sure you might have done, that you thought his services would be useful.

The Duke, however, expressly states that he is sure

you were actuated always for what you thought the good of the service, and that he is glad to perceive that Sir Colin himself expresses a high opinion of you, which it seems he did in his own handwriting at the end of the formal reports. As well as I can make out, also the opinion at the *Horse Guards*, is that General Mansfield's letter was very discourteous.

My dear Colonel,

Yours very faithfully,

(Signed) J. F. BURGOYNE.

In acknowledging a letter dated 11th January, from Sir William Mansfield, we next find the following from Colonel Harness :—

Calcutta,

18th January, 1858.

I have to acknowledge the receipt of your letter of the 11th inst., forwarding to me a copy of a communication addressed by direction of His Excellency the Commander-in-Chief to the Secretary of the Military Department of the Government of India, relating to me. And I have to request you to express to His Excellency my grateful sense of the kindness evinced by him in that communication, but at the same time to state that neither other honourable employment nor the recognition of former services can relieve the disappointment caused to me by not being permitted to remain with his army; that during the remainder of my life the painful sense of being sent from it will never be lost; and that these feelings become each day more oppressive to me.

I shall now consider it to be my duty to endeavour to form an opinion on any subject submitted to me by the Indian Government when not incompatible with my duty as the Commanding Royal Engineer of the Royal army in this country; and I shall be gratified by being referred to.

On the 28th January, 1858, Colonel Harness wrote to the Adjutant-General in India as follows :—

Various reports induce me to believe very confidently that His Excellency the Commander-in-Chief is preparing to undertake a siege, and that he intends to entrust the direction of the Engineers' department at that siege to an officer of the E.I.C. Engineers who is my senior in military rank.

Under these circumstances I shall be obliged if you will submit to His Excellency my request to be allowed

to take part in that operation ; and, under the orders of the Engineer officer whom he has chosen, to command the officers and men of my own Corps who may be present thereat.

It may not perhaps be right to base such an application on report, however trustworthy ; but the fear of being too late in making it, if their confirmation be waited for, will, I trust, be considered a sufficient excuse, if it be really premature.

Whatever may have been the actual effect of this letter, we find in his diary the following entry :—

1st February, 1858.—Received letters from Major-General Mansfield, marked “confidential” and dated Futteghur, 25th January, 1858, proposing, by direction of the Commander-in-Chief, that I should, if agreeable to me, join the army and assume, under Colonel Napier, who was to be the Chief Engineer, the command of my own Corps at some intended operations. Replied thereto, both by letter and telegraph, in the affirmative.

4th February.—Late in the evening (7.30 p.m.) received telegraphic communication directing me to join the army.

5th February.—Left Calcutta by the 8.30 p.m. train.

10th February.—Arrived at Cawnpore at 10.30 p.m.

11th February.—Reported arrival in person to Commander-in-Chief.

12th February.—Left Cawnpore at 3 p.m. and joined the Engineers Corps at Nawabgunge at 9 p.m.

13th February.—Marched with Engineer Brigade to Burryboiar.

14th February.—Marched with Engineer Brigade to camp near Alumbagh.

The following letters would appear to give the best account of the impressions received at the time by the subject of this memoir during the siege of Lucknow, during which he was second in command of the Engineers to Colonel Robert Napier, of the Bengal Engineers.*

Camp Alumbagh,
21st February, 1858.

SIR,

In compliance with the directions contained in your note, which has just been delivered to me, I have to report that about half-past seven o'clock this morning,

* *Field Marshall Lord Napier of Magdala.*

while on parade with the 23rd Company of Royal Engineers for divine service, a messenger came to me from Major Nicholson, R.E., stationed in the fort of Jellalabad, to request reinforcements; and almost immediately afterwards it was reported to me that an officer from the Divisional headquarters' camp had brought a message from the Major-General Commanding, directing that all the men available in this camp should be sent to support that fort. I therefore directed the whole of the Punjaub sappers then in camp (414 in number, 222 being already in the fort) to be marched towards the village adjoining the fort, and to be halted on the side of the village next to the camp, as many as Major Nicholson might require to reinforce his garrison being detached therefrom. The 23rd Company of Royal Engineers (seventy-four men) and the Bengal sappers (forty-one in number), together 115 men, being ordered to hold themselves in readiness to turn out at a moment's notice. On proceeding to the fort my attention was immediately attracted to a large body of cavalry which, being already well to the eastward of the jheel on the south-east of the fort, was moving quickly south-west. I therefore left the fort directly, ordered Lieutenant Gulliver, of the Bengal Engineers, commanding the Punjaub sappers then outside the village, to move them towards the rear of the camp, posting them in such a position facing to the rear that their left would rest on the jheel; which order he complied with by occupying the village on the jheel to our right rear. I also sent instructions for the sappers remaining in camp to be drawn up immediately in rear of our park. Soon after this was effected we saw our own Sikh and European cavalry moving across the plain to the south of our camp in a direction that appeared to ensure protection from the enemy's cavalry.

Major Nicholson informs me that the enemy first appeared about a quarter before 7 a.m., moving over the space to the north-west of the fort, the infantry in very loose order, but having cavalry and horse guns upon their left. That the infantry halted in the topes of trees, while the cavalry and guns moved as if intending to get to the rear, but eventually halted to the south-east of the fort and about 2,000 yards from it. They maintained a fire from four guns upon the fort, and Major Nicholson praises the energy with which Lieutenant Ford, of the Royal Artillery, opposed their fire with the only gun that could be brought to bear on them. The firing

ceased, and the enemy appeared to him to retire covered by their cavalry, about 11.30 a.m.

Captain Taylor, of the Bengal Engineers, who joined me on the men being turned out to protect the camp, and whom I requested to visit the position taken up by the Punjaub sappers, and to alter it if it appeared to him to be desirable, informs me that about 9 a.m., a little less than an hour after he joined them, he moved them out of the village to the eastward, being requested by Captain Moorsom, of the Quartermaster-General's department, to support our cavalry and artillery then advancing. Having accompanied this body during its advance for about half-a-mile, he remained until they were withdrawn about 1.30 p.m.

The only casualties occurred in the fort when two privates of the Punjaub sappers and one Delhi pioneer were wounded.

I am, etc.,

H. D. HARNES, Colonel.

Colonel Russell, Chief of Staff, First Division,
etc., etc., etc.

The following report was also addressed to Colonel R. Napier, C.B., Bengal Engineers :—

Kaisir Bagh, Lucknow,
19th March, 1858.

SIR,

In compliance with your request, I have to report that the siege operation in which the Royal Engineers under my command have been engaged may be considered to have commenced on the night of the 4th-5th March, when the men of the 4th Company and a detachment of twenty from the 23rd Company were employed, under the direction of Major Nicholson, in making two cask bridges, close together, across the Goomtee; each intended to be 102 feet in length, and the remainder of the river to be traversed by an embankment formed from its left bank by the native labourers attached to the force. One of these bridges was completed by the morning of the 5th, but the number of casks and superstructure being insufficient to span the space between the right bank and as much of the embankment as could be completed during the night, only one communication could be effected, and that by making the barrel portion about 135 feet in length. During the day of the 5th embankments of sufficient

length were formed and the two bridges completed in accordance with the original design by the native sappers and pioneers under their proper officers. Cover for men and guns to protect the bridge was formed on the left bank by a working party of the line under the direction of Captain Lennox, R.E.

On the 6th inst. Sir James Outram crossed the Goomtee with the First Division, and the 4th Company of Royal Engineers, under the command of Major Nicholson, was detached from the Engineers' Brigade to move with that division. Major Nicholson's reports of the works performed by him between the 6th and the 16th inst. are annexed. I will now only request your particular attention to the praise he bestows on Lieutenant Wynne, R.E., for his conduct on the 14th inst.

On the evening of the 6th, in consequence of an order given to me by His Excellency and reported to you by me, I ordered Lieutenant Harrison, R.E., to inspect and report upon the road between the camp of the Commander-in-Chief near Dilkoosha and that established by Sir J. Outram. His report was forwarded to you by me on the morning of the 7th. On the 7th, Captain Lennox, with the men of the Royal Engineers available for work, was employed in moving the lower of the two bridges established on the 5th about a mile down the river; which work he completed during the afternoon, and that portion of the siege train attached to Sir J. Outram's division passed over it.

On the 8th inst., the upper bridge of casks was removed by Captain Lennox from its first position, nearly to the new position of the lower bridge.

On the afternoon of the 9th inst., Captain Lennox, R.E., with Lieutenants Malcolm and Pritchard, all these having been present with the former advance of the Commander-in-Chief on Lucknow, and therefore acquainted with the Martiniere, were ordered to accompany the column appointed to assault that building. And in the evening, after that building had been carried and it was observed from it that the enemy had abandoned a large portion of the entrenchments in its rear, Lieutenant Beaumont, R.E., was ordered to attend the officer directed to occupy the abandoned portions during the night. Captain Lennox remained in the Martiniere during the night with General Lugard, by whose division that building and the entrenchments referred to had been carried.

During the night of the 9th-10th, Captain Clarke,

R.E., Lieutenant Harrison, R.E., and a large party of natives were employed in moving the upper bridge of casks from the place down the stream to which it had been removed from its first position to that part of the river on which the enemy had closed, namely, the left of the entrenchments now occupied by us.

On the 11th, Major Nicholson having reported that Lieutenant Swetenham, R.E., had been wounded, and that he greatly needed another officer, Lieutenant Malcolm was detached to his assistance.

The same day, on an order to repair the bridge across the canal near Banks's house, Captain Clarke was directed to execute this service, assisted by Lieutenant Pritchard, R.E. The space to be spanned was 36 feet in width, and twenty-one hours were occupied in repairing it by about fifty men of the 23rd Company.

And in the afternoon of this day, the garden wall of the Begum's palace, the entrenchment in front of it, and the serai on the opposite side of the road having been breached by guns in battery near Banks's house, and the intention to assault it by three columns having been made known to me, I requested you to permit me to detail an officer to one of the columns of assault, which being assented to, I named Captain Cox, R.E.; and it was arranged, in order that he might not supersede the subaltern officers already appointed to the columns, that he should accompany the column to which Major Taylor, of the Bengal Engineers, who was to be the directing Engineer of the assault, intended to attach himself. This was done, but Major Taylor being unfortunately wounded during the operation, Captain Cox became the senior officer with the party within the captured premises, and was, as such, placed by me in communication with the Brigadier commanding the troops by which the assault was effected.

During the evening an order was sent to me by you to remain in the captured premises, and since that period I retained by your desire the principal direction of the operations on that line, which terminated in the capture of the Kaisir Bagh on the 14th inst.

During the night of the 11th and 12th the obstacles to a free communication within the premises of the Begum's palace and with the public roads were removed; an epaulment thrown up to protect our communication across the road between the palace and the serai, and to serve also as a parapet for two guns to oppose the enemy's works which enfiladed the road; and during the

day of the 12th two openings were effected through the wall separating the Begum's property from Jaffir Ali's, whose house was then occupied by our troops without resistance ; and at the same time a small serai, in advance of that captured the preceding night, was occupied without resistance, together with a small mosque contiguous which overlooked it. Some 8-inch mortars were moved into the small advanced serai, and some placed in rear of it ; and some 10-inch mortars into the larger but more retired serai, with directions to shell that part of the city immediately in our front, extending to and including the Kaisir Bagh.

In the night of the 12th-13th an opening was made through the walls between Jaffir Ali's and Jarn-oo-doulah's premises, and the latter were partially occupied on the 13th without resistance. But as it was found at daylight that the musketry of the Imaumbara could bear on the opening that had been made in the front wall of Jaffir Ali's property, a new opening was made through it into a row of sheds at right angles to it, by the destruction of the cross walls in which a perfectly covered route for the guns was obtained, and they were placed in battery during the afternoon within about seventy yards of the wall of the outer court of the Imaumbara, and had completely breached the outer wall and partially breached the inner one before dark, one 8-inch gun and one 24-pounder being employed for the purpose.

During the night of the 13th-14th the outer breach was examined and found to be very easy of ascent. It was also intended to have examined a trench which it was observed the enemy had formed across the road on our left to flank the outer wall of the Imaumbara, but the enemy discovered the attempt and wounded the Sikh soldier who was accompanying the Engineer officer.

Fire was maintained upon the breach during the night, two discharges of round shot being followed by a shell and a round of grape, and at daylight the breaches were considered so far advanced that arrangements were made for their assault.

A party of 100 Sikhs was to form the storming party, to be followed by ten native sappers with powder bags under Lieutenant Brownlow, of the Bengal Engineers, and ten scaling ladders carried by thirty Royal Engineers and fifty sappers under Captain Clarke, R.E., with Lieutenants Medley and Laing, of the Bengal Engineers ; these to be followed by 200 infantry, who were

taken, I believe, from the 10th Regiment. A native working party, under Lieutenants Scott, Frazer, and Burton, R.E., were to follow this column with tools and materials for any cover or entrenchment that might be found necessary, and the whole of Brigadier Russell's brigade was to be retained in readiness to support the assault.

It had been observed that between the trench which the enemy had made across the road and the breach there was a door in the outer wall of the Imaumbara, and it was reported that there was a corresponding door opposite to it which would lead into the principal building. Arrangements were therefore made for a party of twenty-five men to advance against the trench, followed by an officer with a powder bag to blow in the outer door, at the same time that the storming party moved forward; and Lieutenant Brownlow was directed on passing the first breach to turn to his left and blow in the opposite door if he found one.

Lieutenant Beaumont, R.E., was ordered by me to be prepared to blow in the outer door. His attention being thus directed to that part of the enemy's works, he found reason to believe that the trench on our left was in connection with a house on our side of the road between us and the Imaumbara, and that if manned when we proceeded to the assault it would be from that house. He asked permission, therefore, to be allowed to work his way through the few earthen walls between us and the house in question, and with the aid of Major Brazier's Sikhs and a few of his men to blow in the wall of the houses and expel the enemy. The permission was, with the approval of Brigadier Russell, given to him, on the understanding that he would return and report the result; or if his proceedings were not completed before the breach was ready, that I should recall him to carry out the original plan of blowing in the doors. He succeeded in driving the enemy from the house, and he then proceeded to blow in the outer wall of the Imaumbara at the end of the trench, which being successfully executed the Sikhs rushed in at the moment that the assaulting party had been ordered to their arms. The unexpected entry of the Sikhs through the opening made by Lieutenant Beaumont checked resistance, and the assaulting column passed the breaches without difficulty, and were able to seize as rapidly as openings could be formed for them the enclosures of the King's coachman's and the King's brother's houses. The roofs of the latter looking down

on the Kaisir Bagh offered a good position for our new front ; and having succeeded in collecting about 100 men in each of the two buildings which compose the King's brother's residence, I recommended Brigadier Russell to stop the further advance and obtain firm possession of the ground we had passed over. The Sikh Regiment, however, persisted in pressing forward, and made their way into the courts of the Kaisir Bagh, followed by many of the troops who had taken part in the advance. As soon as practicable, therefore, an opening was formed from the China bazaar into the court where the two large tombs are situated (the plan recommended by Mr. Kavanagh, whose local knowledge at this moment was valuable), and small detachments of men who had not lost their order were placed in commanding buildings, viz., the large tombs, one of the detached buildings in the great court, and the gateway in the centre of the north-west side of the latter. Soon after a party of about sixty men of the 10th Regiment was marched round the great square in order, halting occasionally as they passed the south-east and south-west sides, from which alone any fire was maintained by the enemy, and sending a section in to search the buildings. At two or more points large numbers of the enemy were seen by the parties thus sent in, endeavouring to escape, and in these instances more men were sent in to fire from the roofs, and no doubt many of the enemy were thus killed. During the afternoon and evening, as troops came up they were quartered in the buildings, and the return of the enemy in force was prevented by their presence, though casualties continued to occur till late.

Much gunpowder was discovered by the men who searched the buildings, and Lieutenant Beaumont, who accompanied the party, was employed in destroying such portions as appeared most in danger from the fires burning in three parts of the square. And on the 15th the whole day and all the available working men were employed in checking or destroying gunpowder.

I have thus related to the best of my recollection the events which took place under my notice from the 6th to the 15th inst., and have only to report to you that every officer under my command whose name I have mentioned in this report conducted himself with zeal and intelligence, and that one and all deserve your approbation. But I must particularly record the very high opinion which these operations have enabled me to form of Captain Lennox, R.E., and Lieutenant Greathead, of the Bengal

Engineers. I must also praise most highly the intelligence and zeal of Lieutenant Beaumont, R.E. ; but as I do not approve of his having blown in the outer wall of the Imaumbara before he had reported progress and obtained instructions, he does not rank as highly in my estimation as the two officers above mentioned.

I annex the report addressed to me by Lieutenant Greathead of the proceedings adopted for the occupation on the 16th inst. of the Tara Koti.

I ———, etc., etc.,

H. D. HARNESS, Colonel.

The following remarks of Sir John Burgoyne on the subject of the Commanding Royal Engineer in India having been ordered to Calcutta, and which reached Colonel Harness during the Siege of Lucknow, will help to explain one of the difficulties of the situation :—

29th January, 1858.

I regret exceedingly to hear that Colonel Harness, who was sent to India as Commanding Royal Engineer, after joining the Army, has been ordered to the rear.

We have a right to suppose that Sir Colin Campbell, in his discretion, had reason for this act, so very degrading to Colonel Harness, and so contrary to the custom of the Service and the organisation of the Corps of Royal Engineers in the field ; and I hope that he will send home a full explanation of his motives, in order, that if there is anything wrong in the selection of the officers, or the system pursued, it may be amended.

A Commanding Royal Engineer for the field is always selected for the qualities he is thought to possess, to regulate every part of the Corps, and every branch of a Service, which, it cannot be denied, is of great importance, and requires lengthened experience and peculiar acquirements.

His place is decidedly at the side of the General in Command, to receive his orders in general terms, and to carry out the details.

It would be a complete derangement of the proper functions of officers, and of the true spirit of organisation of every branch of the Military Service, to trust the management of so important a charge, to whatever subordinate officers might accidentally be with the force, who might not be superior men, not likely to have much experience, and certainly without authority or means for

regulating more than what is immediately under their eyes ; nor is it possible that the ordinary staff of the Army can have time, or be duly competent, to undertake the charge.

I regret this measure the more, as it is reasonable to suppose, that the operations of the army in India will partake very much of engineering proceedings, in which, as well as those in actual progress as in prospect, I am certain that Sir Colin Campbell would have derived the greatest advantage from the professional advice of a man of such superior talent, energy and knowledge, as Colonel Harness.

That there is nothing derogatory in a General-in-Command considering it desirable to consult such officers professionally in the peculiar branches, we have an instance in the case of the late Duke of Wellington in the Peninsula, who consulted them invariably on all engineering matters, frequently gave up his opinions to them, and always desired to have those of superior station near him.

Colonel Harness can be, as Colonel of Engineers, of no use at Calcutta ; he will be, in fact, there acting as an inferior officer of the Staff, or a Commissary in sending up men and stores according to the requirements of the Engineer officers dispersed about the army, whose orders (as they will be in fact) will, for the sake of nominal discipline, be given to him in the name of the general.

(Signed) F. J. BURGOYNE, I.G.F.

Horse Guards,

March 3rd.

MY DEAR HARNESS,

I send a copy of Sir John's minute on your letter.

I was sorry to find added to the copies of letters you sent me the one asking for Cox to be ordered back *at your expense*.

That last letter had not been sent to the Horse Guards, so I was enabled to speak to the Adjutant-General and to the Duke more forcibly in your favour than if it had. All your previous letters were courteous and conciliatory. General Mansfield's was harsh and discourteous.

I hope the Duke will take notice of the discourteous style of General Mansfield's letter. I had a very long conversation both with the Duke and the Adjutant-General about it. You were, of course, wrong in taking upon yourself to permit an officer of Engineers to move

anywhere "in India"; such being quite contrary to the orders of that country, and I did not complain of reproof being given for what you had done, but I did complain most strongly against an officer of your high standing and character being reproved in an uncourteous manner when there seemed to be no reason for doing so, as your letters were most courteous.

I want to ask information from you.

1. *Tools and Stores.* I am not doing anything about supplying you. Have you all you want? Neither in private nor officially have I had a hint that you have any wants of this nature.

2. Let me know about the Second Captains of Companies. I consider that our companies should be commanded by Second Captains, and that there should be a First Captain between the General of Division and the Second Captain of the Company. If from various reasons the Second Captains have been taken away from their companies to do the duty of the First Captains, then we might have ground for asking for these latter (which Lord Panmure refused to allow to be sent) because it is not according to the rules of the Service to have companies commanded by subalterns.

3. Order the officers in command of the Engineers in any engagement to send a nominal return of officers and men engaged. Certify these returns and send them to me. They will be very useful in the event of medals being awarded or questions raised hereafter. Lennox sent me such a return after Peel's action.

Having no assistant I have much to do, and I cannot write long letters. I thank you much for yours. Rely on being supported by us at the Horse Guards. Do not allow anyone to irritate you out of your natural dignified and courteous manner. Hold on to your duty, and Sir Colin will come round to you at last.

Yours very truly,
J. W. GORDON.

The following personal remarks extracted from private letters will all be of interest to the reader :—

Kaisir Bagh, Lucknow,
25th March, 1858.

" We reached it (the force on the march to Lucknow) on February 12th, and have been with it, living in a tent, until we captured this place on the 14th (March?), since which I have slept in it, and my present abode, with most

of my officers, and part of the men, is in that particular house of the palace which was allotted to the Nautch girls ; and I have twenty-two looking glasses in the room I have appropriated. It (the city) is now entirely deserted, except by soldiers and camp followers. It has been a fearful visitation on it ; there was something very extraordinary in the feeling with which, in following the advance of our people on the 14th, one suddenly found oneself in the great square of the palace. I was entirely unprepared for anything so extensive and magnificent, and the sudden entry into it was most striking. My only reminiscence of the capture is a stone paper weight, with some sort of animal for a handle, which shall be placed on your table at Sherborne."

"It seems a strange dream to have passed through, and very wonderful that one should be able to witness so frightful a visitation as that which has fallen on this large city, with so little feeling of sympathy for its inhabitants. I am now expecting to return to Calcutta, but this is not yet decided."

"Although Rohilcund has still to be pacified, we look on the Mutiny as put an end to, as far as any large occupation is concerned."

"Hitherto the place has agreed very well with me, but it is now getting excessively hot—the greatest continuing heat I have yet experienced ; the temperature at five yesterday afternoon was 100."

"The rapidity with which the furniture of the houses is destroyed is quite wonderful ; the only thing more wonderful is that anyone should have such great delight in its destruction."

After the fall of Lucknow Colonel Harness found himself attached to army headquarters, and, as Sir Colin Campbell came more and more in touch with him, he began to discover that he had within his reach a man whose wide and ripe experience was second to that of none of the distinguished officers then serving in India.

On the 22nd, 25th, and 30th, April, the headquarters of the army were at Meran-ka-serai, Futtehgurh, and Shahjehanpore respectively. On the 12th May he presided over a committee to consider the means to be taken for housing the troops in existing buildings, and of placing the fort in a state of

defence, and on the 15th of the same month he reported on the whole subject of sheltering the troops in Rohilkund.

From a letter sent home from Bareilly the following is an extract :—

12th May, 1858.

“Your letter of the 8th March only reached me this morning, though a letter from Sherborne of about the 24th March reached me three or four days ago. This is like the case you mention in your letter, of the receipt of one of mine of the 9th January after one of the 25th of the same month; and no doubt all the blundering in both cases has been in India. The Post Office is execrable—worse than any one could imagine until acquainted with it. Your letter was received in Calcutta a month ago, was clearly directed, and ought to have reached me three weeks ago. We reached this place on the 6th, and had a little contest to enter it, of which you will no doubt read an account in the *Times*, although their correspondent was too ill to see much of it. He will describe better than I can an extraordinary scene that took place during the contest, although I was a close spectator of it, and he will only write from description. A number of fanatic Mohammedans (about 200) who had taken an oath not to go back, came out, armed only with swords, against that part of our front at which the 42nd were posted. They must have had nearly 300 yards of open ground to pass over before reaching the line of the 42nd, during which time they were under fire of that regiment. They came out in two parties, one about ten minutes before the other. The first party, following some of our Sikhs, whom they drove before them out of the buildings from which they advanced (previously entered by the Sikhs), got close to the centre of the 42nd before they were all killed. But the second party, who were fired upon the moment they appeared, did not pass half the interval before the last man was killed.”

“One last man was advancing, after all his comrades had fallen; but it was—and with the fire of a regiment on him alone—could be, only for a few paces. Previously to this a single individual of the same kind came out against the line from a wood into which some of our artillery were firing. The firing was stopped, and when he took no notice of the signals made to him, an officer (I think) rode towards him. When tolerably near the fanatic fired at the officer, and calmly began to reload. While he was reloading several cavalrymen

galloped out, and an extraordinary contest took place. The cavalry kept galloping round him, and discharging their pistols at him ; he found time to discharge his piece twice, and afterwards to make sundry attacks on them with his sword ; but he at last fell from a pistol shot, and without having injured any one."

In September, 1858, Colonel Harness was at Calcutta, and it was at this time the question of the employment of the Royal Engineers under his command in the Public Works Department led him to write, privately as well as officially, to Colonel Gordon. The following are extracts from his private letters :—

"The extracts annexed to my official letter, from the code of the Public Works Department will, I hope, enable you, or any one desirous to understand its organisation, to realise it. It is very peculiar, and my own opinions would lead me to object to our people being employed in that department on account of its organisation."

"We wish our officers and men to have, in as great perfection as possible, those military habits of thought and action which are essential to military success, and are the characteristics of high discipline. Combined with these, we wish our officers to have the greatest amount of professional knowledge attainable ; with this remarkable peculiarity with respect to their knowledge, distinguishing them from the military Engineers of other nations, and from the Engineer Corps of the East India Company, that, being required to exercise every branch of their profession in all parts of the world, with but few of their number available at any part, local peculiarities in working details must be comparatively lightly regarded by them, for they are too numerous to be known ; while general principles of construction and those which should decide the adoption of an engineering work, or the selection of engineering means, which principles are universal, should be deeply studied by all of them."

"To allow our officers and men to be employed in a department where military rank and authority are played with in the extraordinary way in which they are played with in the Department of Public Works, would be to expose them to most injurious influences. By merely reading its regulations, a strong impression must be received that these influences would be prejudicial to the

habit of unquestioning obedience to the orders of military superiors which it is the first object of military discipline to create. And I have seen, and have no doubt that it is a consequence of the character of their employment, that East India Company Engineers have not the habit of obedience. They question and consider every order, whether it permits them discretion or not ; and my impression is, that when left to themselves, they do very much as they please about obeying one. With undisciplined and ill-commanded enemies, such as they have been opposed to, this has been harmless. They are very fine, clever, spirited, fellows ; and, as operations in India, I presume, may always be conceived and carried out with an extremely adventurous spirit, such men are very useful. But with its officers so undisciplined, an army could not oppose successfully a highly disciplined European force. What hope could there be that any design of a general would be fully carried out, if officers questioned their orders, or assumed a discretion not given to them, to do either more or less than those orders directed? Our people must obey habitually, exactly, literally."

In October, 1858, Colonel Harness had returned to Allahabad, and reported thence on the defensible condition of that important strategical point, after considering a number of reports and projects which had been laid before him, which referred not only to the fort of Allahabad itself and the railway communications with the station, but also to the whole question of the making of strong places "of refuge," wherever strategical conditions defined the necessity for rendezvous and defence.

As regards Allahabad, the following remarks extracted from his report (subject to the further increase of range and modern projectiles) are as important now as then.

The military principles affecting the selection of the site for this bridge (the proposed railway bridge over the Jumna) may, I think, be thus stated :—

(1) The most important advantage attaching to a fortress at the confluence of two streams, is the power which it preserves at all times to its possessors of transferring troops and military stores from any one of the

three districts, into which the country is divided by those streams, into either of the other two districts. ❧

(2) In all cases where both the streams are of considerable width, and in many cases when only one of them is very wide, a permanent post ought to be established, opposite to the fortress, on each of the two rivers—wherever such posts are necessary to secure the passages, a fortress at a confluence ought not to be considered completed until they have been added—and if either of the permanent posts thus added be small, a portion of the ground about it should be so formed as to afford cover for a large body of troops, without impeding their advance when in sufficient strength to move.

(3) If the means of communication across these rivers be exclusively military, each landing-place, if boats be used, each abutment, if a bridge, should be within the defences of the permanent posts. But if the means of communication be those by which the traffic of the country is carried on, the restrictions necessary for the security of a military post being incompatible with the freedom which is essential to the development of trade, it would be preferable that the termini of the several lines of communication should be on ground duly covered from the view of the enemy, and commanded by the permanent works, or by advanced or detached posts having good communications with them.

These principles are easily applied to the question referred to me. The fort of Allahabad is at the confluence of two very wide rivers, the Ganges and the Jumna; neither of which being at present bridged, the communications are maintained by boats.

Proper posts on the opposite banks of the Ganges and the Jumna, with proper landing-places within the defences of these posts as well as of the fort, are necessary to the completion of the military position; and the means of rapidly moving a number of men by boats, between any two of the three points thus occupied, ought to be at all times, until secure bridges have been established on both streams, under the exclusive control of the officer commanding that position.

A railway bridge across the Jumna in the vicinity of the fort will afford additional facilities for military passages of that stream; and, independently of the great public value of so important a part of the railway—which is a reason for guarding it more carefully than other portions of the line—its usefulness as a

communication across the stream makes its protection a military object. But we all hope to see that railway develop an enormous traffic, and within no very distant period to find a very large, very wealthy, and therefore very influential, commercial community, interested in the rapidity and regularity with which that traffic is carried on; and if this hope be realised, neither the regulations of the authorities who may direct the working of the railway, nor their wishes for ground, etc., for the working of the railway, nor their wishes for ground, etc., for the expansion of their means at any point, ought to be in danger of being opposed to the military views connected with any permanent fort. Whatever section, therefore, might have been proposed for the railway in the vicinity of the fort at Allahabad, the line should be traced at a moderate distance from the fort; and if the railway is to be formed, as proposed, at an elevation which will afford a command over important portions of the defences, that circumstance is a reason for preserving a wide interval between the railway and the fort.

The most desirable distance between the fort and the bridge may be considered to be that which, while it renders the command of the railway over the works of the fort comparatively unimportant, permits the communication between the bridge and the fort to be secured by the joint action of the latter, and of a small post in and on the abutment of the former. From 1,400 to 1,500 yards may with this view be assumed as a proper interval; and at that distance from the fort the river is favourable for the construction of the bridge. It is hardly necessary to point out that the mode in which the intervening ground is formed and occupied (if occupied at all) will be very important.

By crossing at the place thus suggested, the line will be brought across to the small redoubt on the right bank, which may facilitate the defence of the bridge on that side; and if hereafter it should be deemed desirable to extend the military occupation of that bank which on considering the probability of a great and rapid increase of the commercial importance of Allahabad, and the mutual embarrassments produced by conflicting requirements, when military and commercial establishments are intermixed, or contiguous, appears far from improbable—then the command and defence of the bridge from that side might be easily effected.

In November the subject of this memoir reported on

several of the Oude native forts, and in connection with the general subject of Indian forts the following notes amongst his papers have been found:—

The Indian forts that we have met with have all the same general characteristics—their strength consisting in a formidable relief, and in the difficulty (perhaps impossibility by cannon) of forming a practical breach—the whole, or nearly the whole rampart being made apparently of an adhesive earth worked up as clay for bricks would be. The trace is frequently a square of greater or less extent, having at the salient angles, and at intermediate points where the line is long, solid towers of which the exterior diameter is 50 or 60 feet. There are generally two enceintes: the outer being formed of an earthen rampart and ditch, as above described; the inner of a defensible dwelling, square or rectangular, with towers at the angles, a flat roof, and parapet. But in addition to these enceintes, three places that the army has lately met with have each presented an extensive exterior line of works—at Rampoor Kussia, at Ametie, and at Shunkerpoor, from 200 to 250 acres of ground, in some parts very densely wooded, had been enclosed by a line of greater strength in almost every part than would be expected to be met with in any field work, and in some places presenting a very difficult obstacle. Thus the exterior ditch of Ametie was not in any place where the thick thorny jungle would permit it to be approached less than 20 feet in width, or 15 feet in depth; and a large portion was 30 feet wide, and a part 30 feet deep.

The defects of these forts are the general liability of every line which could bear on the approach against the point selected for attack to enfilade, and the total want of bomb-proof cover. These defects would most probably cause the surrender of an ordinary fort of which the area was five or six acres within a couple of days to an army provided with mortars and howitzers. But against an army insufficiently provided with these weapons, a fort well defended might hold out for several days. Approaches against the works would be necessary, and perhaps a regular descent into the ditch, and a heavily charged mine to effect a breach might be required.

(Signed) H. D. H.

25th November, 1858.

In December, 1858, he was required to report generally on

the barrack accommodation at Lucknow, and in the same month we find him at Beiram Ghaut and Barraitch. He also drew up a memorandum on the fort of Musjidia.

Writing home on 1st January, 1859, his personal remarks are characteristic.

You will see by the papers what an interesting day we passed yesterday.

The Nana, whose personal movements it has been impossible to trace for some time past, is now known to have been present, and to have mounted an elephant and gone off the instant our first gun was fired. He is now, I think, the only person to whom almost every one would be unwilling to extend mercy, and whom all long to see captured.

Captain Cox, my adjutant, has left India by the mail of the 23rd December from Calcutta.

You will like to know that except for being away from all my belongings, I do not suffer by being here, and can go through everything almost as well as younger men—better than many young ones. Lord Clyde is the only person in the field, I think, who is older than myself; he is nine years older, and can do much more than I could, but his strength and constitution are naturally great. I like him very much, and think he likes me.* He is at present suffering considerably, more than he will admit, from the effects of a fall. His horse fell with him on the 26th December, while he was galloping after some of our guns, to whose officer he would give some directions, and he came to the ground very heavily; the right shoulder was found to be dislocated, but was immediately set. From the fall to the completion of the setting could not have exceeded ten minutes, and he has no other serious injury. But he evidently feels much pain in the arm, and in his body generally, but will not give way in the least.

In January, 1859, in consequence of a note from Colonel Gordon of 26th November, 1858, in which he was informed that a remark in confidential correspondence between Lord Clyde and the Adjutant-General of the Forces, he had been represented as "thwarting the Commander-in-Chief (in India)

* This liking was strongly shown in after years, when Lord Clyde was staying with General Eyre at Chatham and Harness was Director of the R.E. Establishment.

with respect to the employment of the Royal Engineers in the Public Works Department," Colonel Harness replied that :—

There exists, however, some strange misapprehension. Before reading your letter, it had never occurred to me as possible that the Commander-in-Chief could regard me as "thwarting his views." On the contrary, I was under the impression that, as a military man, he concurred in the opinions expressed, although he might have considered them somewhat strongly expressed and obstinately adhered to, when the Civil Government of India were so anxious to obtain the assistance of our officers and men. My wish has been that the Government shall receive the assistance of our officers and men to the utmost possible extent consistent with the maintenance of their military organisation and discipline; but this condition is inconsistent with their employment in the Department of Public Works.

I have this morning mentioned to Lord Clyde the extraordinary impression received at home, that in remonstrating against such employment I was thwarting his views; and he assured me most strongly that he never thought so, expressing himself in terms directly opposed to his having any such impression. But he thinks that it is of great importance to us to maintain our footing here, and that in order to do so some concessions must be made, such as have now been made, of which you will have been informed by my last letter.

A short time previous to this Colonel Harness had written to Lord Clyde in the following terms :—

MY DEAR LORD CLYDE,

I have considered our conversation of this morning and hope to be able to offer such suggestions as will enable the Royal Engineers to assist the Indian Government in providing barracks for our troops. I see no difficulty in proposing arrangements with that object; though not knowing the different places at which such provision is to be made, I cannot suggest a distribution of our men and officers for the purpose.

The general principle observed in their distribution should, I think, be that the captain of each company, with his officers and men, should take charge of all the works of this nature within a certain district.

In support of his desire to meet the needs of the service in respect to the employment of the Royal Engineers, Colonel Harness wrote on the 11th February, 1859, from Lucknow to the Adjutant-General of Her Majesty's troops in India as follows :—

It would be beneficial, both to the general character and discipline of the men, to have their time thus occupied if the manner of their employment were unobjectionable.

Under these impressions, but in the belief that their employment in any way which removed them from military habits and the control of their own officers, or which taught them to look to others than their own officers for reward or advancement must be prejudicial; and in the absence of any decision on the proposition contained in my letter to the chief of the staff, dated 18th December, 1858, I am induced to submit for the consideration of His Excellency the Commander-in-Chief the following suggestion.

That the officers commanding the 4th and 23rd Companies shall be respectively authorised to supply weekly, viz., from Monday morning to Saturday evening (the men being with their companies on Sunday) to the executive Engineers at Fyzabad, Gouda, and Lucknow respectively, such as they consider can be employed away from the immediate surveillance of the officers of the company, but not exceeding one-half the number present with the company. That the officer commanding the company shall make such changes in the men so employed as he may think fit at the end of each week, and shall not at any time lose his control over the men, but be able for the sake of discipline to withdraw any one of them, summarily, from the works, or to make any one of them a prisoner if he consider it right and proper to do so.

That the working pay be paid every Monday for the men employed during the preceding week to the officer commanding the company, or person appointed by him to receive it; a proper list of its apportionment being delivered with it.

That no rate of working pay higher than that of the class on which the man may be shall be paid to any man without the approval of the commanding Royal Engineer on the recommendation of the officer commanding the company.

In concluding this letter I think it right to add that,

when writing to the chief of the staff on the 18th December, it was my object to suggest the employment of the officers and men in India in exactly the same manner as they would be employed elsewhere. And with respect to the men, not to limit their services to the duty of superintendence. In the West Indies our men work at all seasons and throughout the day at their respective trades ; and, at least in these provinces of India, they could be so employed under shelter during a large portion of the year. And although the price of native labour is extremely low, I think it probable that English skilled labour will be found, as it has been found in other places where the wages of labour are low, to be the more economical. I once observed that a native carpenter took a whole day to dress two sides and the edges of a plank, which an English carpenter would have completed, with a plane, in twenty minutes. The cost of employing a sapper as a carpenter, instead of as a soldier only, is the amount of his working pay, which at one shilling per day would be less than one halfpenny for the twenty minutes in which he could do the work that with native labour cost threepence.

One of the conditions affecting the position of the Royal Engineers in India which Colonel Harness had to consider arose out of the fact that the Department of Public Works was so intimately associated with the three Corps of Indian Military Engineers in anything on which public money had to be expended, that immediately a state of war ensued in any portion of the country the existing organisation immediately fell into line with military exigencies and such works that might be required for military purposes in which an expenditure, on either labour or material, had to be incurred, were carried out, whether their necessity might be civil or military in character, by the officers in charge of the department, whether civilians or soldiers.

He held that his first duty was to maintain the distinctive military character of that part of the army with the command of which he had been entrusted ; and he also held very strong views on the subject of the system under which expenditure on works was carried on, which was in use by the Public

Works Department, and which he regarded as having the tendency, to say the least of it, to demoralise the executive whose duty it was to superintend the working of that department.

He did not shut his eyes to the practical value the existence of such a civilian organisation, largely administered by military Engineers, must have had at a moment when India stood face to face with dire peril ; and, when the intimate acquaintance of the military Engineers with the resources of the country and with a handy system of administering the expenditure on their use, was an important factor in the interests of early success.

In maintaining his views on the subject as it effected the employment of the Royal Engineers in the public works towards the close of the military operations, he felt that there was no obligation imposed on him to defend a system the details of which, even for peace purposes, he disliked ; and there is no doubt that an apparent want of appreciation of the splendid results that had been achieved by the Bengal Engineers during most critical periods had the effect of emphasising differences of view which at other times might have been left to themselves to adjust.

His opposition to interference with the integrity of the military units under him was the *prima facie* cause of the course of action he followed ; but he made no secret of his dislike to the system under which it was sought by the Government of India to employ temporarily some of his officers and men.

After he left India, the whole question of the amalgamation of the Royal and Indian Engineers was dealt with, but beyond consulting him, the authorities did not bring him into intimate touch with, or give him an opportunity of influencing, the resolutions or the arrangements which ensued. The attitude he assumed towards the question while still in India more immediately concerns our subject, but in order to illustrate the consistency of his views, the chapter will conclude with some remarks he made on the subject in 1860.

So early as October, 1858, a report from Colonel Harness elicited the following in a private letter dated 3rd November, 1858, from Sir William Gordon, the Deputy Adjutant-General R.E. at the Horse Guards :—

Your last official letter about our officers having been taken for public works was received here when I was absent and was sent on to Chatham, so that I have not read it yet. The private letters from yourself and Cox I have received.

I have not as yet addressed any letter to the Commander-in-Chief on the subject. Sir John thinks it best to wait a little till it is known what is to be *permanently* done. He quite approves of your stating your objection always; and as far as you can of course helping to carry on public duty under present difficulties even in a way that as a permanency you disapprove of.

I purpose to send in a demand for passage for a third draft of thirty men for you.

And again on the 11th February, 1859 :—

I plead guilty to not having backed you up so thoroughly as I could have wished, but I have not, I assure you, been negligent because I opposed your views; but because I was always told, "Never mind, things are in a transition state."

The Committee now sitting will settle all things. I have not been examined.

You will have received confidentially my memorandum sent to the Adjutant-General respecting taking captains from their companies.

If I do not hear soon that you have received it, I will fire off a copy. You will see that I did not fail to speak out to my own master. The Duke too saw the memorandum.

I am quite agreed that we must keep up our military character, and that will be ruined under the Department of Public Works. We must have some district set apart to ourselves to conduct after our own fashion.

In February, 1859, on receipt of the following letter from Major Nicholson, R.E., Colonel Harness wrote to the Commander-in-Chief in terms of the succeeding extract :—

Allahabad,

MY DEAR COLONEL, 9th February, 1859.

Two of our men who were sent down here as convalescents, viz., Sapper O—, of the 4th Company,

and Sapper H—, of the 23rd Company, applied to me the other day to be allowed to offer their services to the Superintending Engineer here. As the men were thought well enough by the doctor to undertake the work, and as Captain P— seemed to think that he could employ them with advantage, I thought you would approve of their making themselves useful instead of remaining in idleness until they should be ordered to join their companies. I hope you will approve of what I have done; knowing that many of our men have been employed in this way, I thought you would not object to this.

Pray remember me to Lennox and the rest, and believe me,

Yours truly,
L. N.

On receipt of this note, Colonel Harness wrote at once the following letter :—

(Probably from Lucknow, about
16th February, 1859.)

SIR,

On the 12th inst. I was informed by a private note from an R.E. officer at Allahabad that two sappers of the R.E. who were at Allahabad as convalescents had applied to him to be allowed to offer their services to the Superintending Engineer there, as they were thought well enough to work, and the Superintending Engineer could employ them, and that he thought I should approve of their making themselves useful until ordered to join their companies. Disapproving the act of these men in offering their services, and considering any arrangement objectionable by which men of the Royal Engineers are detained from their companies, except when specially selected for particular duties, I wrote on the same day that the note reached me to Q.M.G. of the army, and requested that these men might be passed on to their respective companies immediately.

The Q.M.G. has forwarded to me in reply to that letter a telegraphic message from Allahabad, which merely states that the men "are employed by the Barrack Department at this station," accompanied by a memorandum that such being their employment, His Excellency the Commander-in-Chief does not wish to order the two sappers to their companies. I have to request you to submit this letter to His Excellency, that he may be acquainted with the circumstances of the case. I presume that he would not approve of two privates of any one of

the English regiments left sick at Allahabad offering their services on becoming convalescent to the Public Works Department, and of their being detained from their regiment without a proper order to that effect when well enough to be passed to it, because employed by that Department. It is my duty to be as watchful of the discipline of the Royal Engineers as it would be of any officer of any other arm of the troops under his command, and I hope, therefore, that His Excellency will pardon my bringing this subject under his notice again.

Suggestions for the employment of the R.E. in hastening the preparation of barracks were submitted in my letters of . . . and . . . In either of the modes therein suggested I have no doubt they could render valuable assistance, by the aid of a large number of men. The value of two men must appear trivial when the injurious consequences to discipline of permitting the wishes of soldiers thus taken is considered.

(Signed) H. D. H.

During the early part of 1859, and before the army headquarters were moved to Simla, Colonel Harness was employed, besides the duties entailed on him as commanding the Royal Engineers in India, in reporting on proposals which engaged the attention of the Commander-in-Chief on the subject of the fortification of Agra and Delhi.

As regards Delhi, Colonel Harness's report gave strong and cogent reasons against military occupation of any part of the city, closing with the following remarks:—

“The situation of the city does not account for its importance. It must be assumed that having been selected as a seat of Government, population was attracted to it, that facilities for crossing the Jumna existed there in consequence; and that these circumstances drew the traffic of a large district on each side of that river towards it, and gave it commercial importance. If it were not included in the course of one of the main lines of railway now constructing, it would most probably soon sink into insignificance; but as one of the main lines will cross the Jumna at the town, it may be foretold with confidence that Delhi will within a few years be the point of junction of branch railways, and become the centre of a far greater trade and of a much larger population than it has ever yet known.

The military occupation of Delhi, then, should be capable of being reduced to the smallest force necessary to command the town in case of disaffection. For this purpose, the position occupied should be sufficiently near the town to enable any part of it to be destroyed by artillery fire. It should also be so near the river as to command its passage ; and it should be as open as possible on all sides, for the advantage of the defence and more easy external communication.

The military occupation should also be capable of considerable expansion ; for circumstances may easily render it a most important military point if its resources are increased by railway communication in the manner anticipated above.

The position selected for military occupation should not be likely to impede such alterations and extensions of the city as the increasing wealth and trade of the citizens may make them desirous to effect. Neither should it be likely to interfere with the requirements of the authorities, whose station will probably require to be continually augmented.

It should, however, be conveniently placed for the support of the railway premises."

Lord Clyde, it appears, did not concur in the views expressed, and gave Colonel Harness permission to send a copy of his report to Sir John Burgoyne, whose reply was as follows :—

" I think I know enough of his Lordship's character to feel assured that he would respect you for stating your opinions freely, and I am sure that he would allow me to do the same ; though I venture to do so with more reserve, because, notwithstanding that you explain the project you wish to adopt, Lord Clyde may have still other reasons for preferring that for which it is a substitute.

The original proposition of the Committee appears to have been to occupy as the military hold at Delhi, the palace with Selimgurh, to which would be added barracks in their immediate neighbourhood : that is, between the N.W. end of the palace and the English Church.

Of this position the palace would be the reserve and main hold.

As a substitute, your suggestion I understand to be, that the main feature of military occupation should be outside the town, covered by defensible positions or posts at the Hindoo Kor's, the signal tower, Ludlow Castle,

and the water bastion, from whence a communication would appear to be very practicable to Selimgurh, which you propose to be made into a strong post, for the command of the important communications across the river by road, bridge, and railway.

Assuming the correctness of what would appear by your description, that the locality you point out is eligible in point of health, as a defensive position, and for other conveniences for cantonments, I cannot but consider that, on general principles, your proposition would be a great improvement on the other.

1. It will be less conflicting with the social and commercial interests of the community ; leaving them to expand without interruption as may suit them best.

2. It will require little or no demolitions, whereas the other would need them largely, and it would not be easy to define to what extent.

3. The new constructions would scarcely be greater in this proposition than by that which applied to the palace, taking into account the very extensive conversions required in the latter.

4. The premises in the palace would no doubt be at least as applicable to many civil or departmental public establishments which must be required at such a place, and which must otherwise be provided for elsewhere ; which would be a set off against any assumed saving by applying them to military purposes.

5. Cantonments within, or in close connection with a town, is on principle to be avoided whenever possible, as it tends to a more intimate mixture of the troops with the population, which is always objectionable ; there is less room for occasional expansion by the military, when circumstances might require it ; the air is seldom so free and pure, nor exercising grounds so good or readily available, and its defensive capabilities less perfect ; besides the great evil, usually accompanying such positions, of being more readily shut up and communication cut off.

With regard to such construction as seems to be that of the palace, very high exposed walls, particularly if they be not of very substantial masonry, give only an appearance of strength ; to resist a *coup-de-main* an entrenchment with a flanked ditch would be as good, and against artillery far better ; besides that, a mass of buildings occupying a comparatively small space, would be peculiarly liable to suffer from shells and vertical fire."

(Signed) J. B.

Colonel Harness's care for the details of the conditions of service of the rank and file of the Corps in India is shown by the following extracts from reports he made on their pay.

"The payment of the N.C. officers and men of the companies of Royal Engineers serving in India is at present regulated.

'6. The N.C. officers and men of the Royal Engineers will receive their British net pay, plus 1d. a day liquor money, converted at 2s. 0½d., less 5d. a day for rations, in the same way as is authorised for the Royal Artillery.'

The stoppage for rations at Malta is only 3½d., but as the men receive no liquor money there, and the ration here is better than the Malta ration, they are not worse paid in India apparently, although the amount, after adding the liquor money and deducting the charge for rations is ½d. per day less, unless the rate at which that amount is converted into Indian currency be disadvantageous to them. But this I believe it to be to the extent of at least 6 per cent.

The rates of working pay of the Royal Engineers have been fixed at ½, ⅔, and ¾ of a rupee per day. They will be unfairly dealt with in this respect also if the value of the rupee be less than two shillings.

The engagement on which our soldiers are enlisted, is, I apprehend, that they shall receive their pay at any place to which they may be sent, according to the British standard, by which 113 grains of pure gold, in good current coins, are considered £1 sterling—or when paid in silver, by the equivalent thereto, honestly computed.

The rupee is a silver coin of $\frac{11}{16}$ ths fineness and 180 grains in weight; but as the relative values of these gold and silver coins have been fixed at fifteen to one, by which the gold is much undervalued, gold is very rarely coined or seen in circulation.

It may, however, be worthy of notice, as having perhaps in some way led to the erroneous valuation of the rupee, that its intrinsic value is greater by about one halfpenny than that of the English florin. But the latter, like the other English silver coins, is only a token, of which the current value is maintained by the strict limitation of the issues, and of the amount to which our silver coin can be used in payment."

In April of this year Sir Charles Trevelyan wrote to Colonel Harness, asking his permission to nominate him to the appointment of Master of the Mint at Madras. In replying he expressed himself as follows :—

“ Lord Clyde has just sent to me your message of the 13th inst. about the Madras Mint, and I have requested him to convey to you by telegraph my thanks for your kind intentions, but to decline the office proposed for me. I think you will have no difficulty in entering into my feelings on this subject. I am in India as Commanding Royal Engineer ; in that capacity the Indian Government has a right to my opinion on every subject on which it is entitled to have any weight, without calling upon me to undertake any other special office. I can hold my present office, and give such opinion when required, without interfering with any of the local interests, of the strength of feeling with respect to which I had no conception before witnessing it. When not required as Commanding Royal Engineer I hope to be ordered to England.”

The inclination on the part of the chiefs of army headquarters to ignore or overlook Colonel Harness's position is exemplified by the incident referred to in the two following letters :—

Simla,
30th July, 1859.

SIR,

I have to relate an incident which may appear trivial, and entirely personal, but which was not noticed by me in the manner herein stated, on personal grounds.

On Monday, the 28th inst., Lieutenant Harrison and myself attended a thanksgiving service at the church for the termination of the Mutiny, in undress uniform, the costume which had been adopted at every previous morning service by the officers who accompanied His Excellency the Commander-in-Chief to Simla as officially attached to his headquarters. We found, however, as we proceeded there that every other officer in uniform was in full dress, and as there was no time to change I joined the Commander-in-Chief on the road, and apologised to him for our exceptional appearance.

After church, however, it was necessary to inquire by whose neglect it was that the order for full dress had not reached me, and it was then ascertained that the order

had been directed "to be circulated to the personal and general staff," and that the Adjutant-General of the Indian army, who had been charged with its circulation, did not consider me as included in the general staff of the army in this country.

I therefore on the following morning wrote the letter of which a copy is annexed, and received the same afternoon the reply,* of which also a copy is annexed.

I consider that it would be unbecoming in me to pursue the subject further, either verbally or by letter, or to make any remarks thereon in this communication to you.

I am, Sir, your obedient servant,
(Signed) H. D. HARNES, Colonel,
Commanding Royal Engineers.

Simla,
29th July, 1859.

SIR,

It caused me some annoyance to find, that from ignorance of the order issued on Wednesday evening, Lieutenant Harrison and myself were at church yesterday morning in undress coats, when all the other officers who attended in uniform were in full dress.

But it greatly increased my annoyance, to find on inquiry that the Adjutant-General of the Indian army, who had been charged with the circulation of the order, had intentionally omitted to send it to me, as not belonging to the general staff. It is new to me to meet with an officer who declines to recognise the Commanding Royal Engineer of an English army, or colony, as a member of the general military staff of that army, or dependency, and I must request you to submit this letter at your earliest convenience to His Excellency the Commander-in-Chief.

I am, etc.,

H. D. HARNES, Colonel,
Commanding Royal Engineer.

The Adjutant-General to H.M. Forces in India,
etc., etc., etc.

The key to the bias indicated in the above correspondence, in view of previous and subsequent events, will be found in the growth of a feeling amongst some of the moving spirits in the army generally, that the Corps of Royal Engineers had

* This letter I have been unable to find.—[Ed.]

made progress during the Crimean War towards a position in the military hierarchy consistent with their attainments and responsibilities: a progress which the chief of the staff in India regarded—as was well known—with no friendly eye.

At the end of the rainy season of 1859, Colonel Harness returned with army headquarters to the plains, and the following letter and memorandum was sent to him by the late Sir Peter Scratchley, then a captain in the Corps:—

Moosa Bagh, Lucknow,
24th December, 1859.

MY DEAR COLONEL,

Major-General (Sir Hope) Grant, commanding Oudh Division, inspected my company (4th Royal Engineers) on the 19th December. He was pleased to say that he had never seen a finer body of men, and that the manner in which they drilled was highly creditable. He further requested me to draw up a private memorandum about the employment of the company, as he intended to write to the Commander-in-Chief on the subject. I forward copy of the memorandum, and hope you will approve of it.

Yours very truly,

P. H. SCRATCHLEY, Captain, R.E.,
Commanding 4th Company Royal Engineers.
Colonel Harness, C.B.

“ Summary of memorandum on the employment of the 4th Company, Royal Engineers:—

1. The Royal Engineers enlist on understanding they will be employed on works.
2. There are four rates of working pay.
3. Elsewhere R.E. are employed on public works under R.E. Department.
4. Sappers can depend on four days' work a week.
5. All R.E. are taught engineering field duties.
6. None of No. 4 Company receiving working pay now.
7. None regularly employed since March, 1859, when the company returned from active service in Oudh.
8. During March a few employed under Executive Engineer Fyzabad, but stopped from heat, etc.
9. From returns, it appears that from date of landing in India (12th November, 1857) to March, 1859, nearly sixteen months, the average days on public works 110, or 7 a month, instead of 16 days a month, according to para. 4.”

“ 10. As regards future employment.

11. Present strength of company at headquarters :— one quartermaster-sergeant, four sergeants, ninety-nine sappers, exclusive of six under Oudh P. W. Department as Prob. Ass. Overseers.

12. Table showing class according to skill and ability by trades :—Total, 83 good, 12 middling, 9 infirm = 104.

13. Of the 104, there are sixty of little use in India, except on active service, owing to their trades.

14. Not more than twenty men fit for overseers in P.W.D., in India, and these nearly all N.C.O.'s., who could not be spared.

15. Deduct 27 per cent. for sick and duty, leaves 77 N.C.O.'s and others now employed.

16. Before deciding how they should be employed, to consider—

17. Pay of a native being 4 annas a day of ten hours, could R. E. receiving 8 annas for eight hours do twice the amount of work so that his work may pay, and could he work all year round?

18. During four months' winter R. E. can do twice the work of a native. During other eight months R. E. can only work under cover with taties and punkahs.

19. Doubtful if R. E. could stand continuous work in the plains.

20. If R. E. can work, what is to be done with those of no trades. (See 13 above.)

21. Can they act as superintendents? but only well-conducted and healthy men could be thus used.

22. Owing to ignorance of language must be kept at same work for a long time, and then cannot do his military duties.”

This was followed by an interchange of the following letters between Sir Hope Grant and Colonel Harness :—

Calcutta,

7th January, 1860.

DEAR SIR HOPE GRANT,

Captain Scratchley has sent me a copy of a paper which he says he has given to you, on the employment of his company, in which, besides stating certain general facts relating to the organisation and employment of our men, he makes some speculative statements bearing on the expediency of their being retained in this country. I shall be greatly obliged if you will let me know whether you regard that paper as a memorandum for your private information, or as one on which you propose to make

any representation relating to my Corps, for the consideration of the Commander-in-Chief, or of the Home or Local Government. And I feel sure that you will readily comprehend and enter into the feeling which prompts my request.

Believe me, my dear Sir Hope Grant,
Very faithfully yours,

H. D. H.

Major-General Sir Hope Grant, K.C.B.,
Lucknow.

Lucknow,

12th January, 1860.

MY DEAR HARNESS,

I have received your letter yesterday. I hope you will not think that Captain Scratchley has done wrong in writing the memorandum which he did at my particular request. The only use I made of it was in my confidential report of the company, in which I stated that I thought it was to be regretted that the men—except in few cases—were not employed working at their trades; that for want of employment they lost the art of working, and I thought except as soldiers they were of little use in this country. I have not got a copy of what I said, but this is the substance. The 4th Company are a fine body of men, and steady and well drilled, and I was pleased to find they were going to China. An order has come from headquarters directing me to give the men at present employed in the Public Works Department the option of volunteering to the India service and retaining their appointments. But the company has marched, and I should think the men will rather go to China than remain here. I trust I may perhaps have the pleasure of seeing you in command of the Engineers in China, but I know little of the appointments made at headquarters.

Believe me, yours very sincerely,

J. HOPE GRANT.

Shortly after, a controversy on the subject arose between Colonel Harness and Colonel Yule. The latter officer of the East India Company's Bengal Engineers was Secretary to the Government of India in the Public Works Department. Any impression that might be derived from the tone of the following correspondence will be entirely dispelled when it is

remembered, that, Colonel Harness never meant that any officers of the Indian Engineers acted improperly, but that he considered the system must inevitably cause some corruption in the department, and also that, these two men loved and respected one another to the last.

General Grant's Camp,
March 15th, 1860.

MY DEAR HARNESS,

To day I received from the Military Department copy of your letter declaiming against a supposed objectionable passage in a despatch.

I answered it at once, sending to Commander-in-Chief for you the real words of the despatch. You will see that the India House letter quite misrepresents the meaning. I read it carefully to-day and found nothing that you could object to except as taking the opposite side. I think that you will even find in it an indication of the feeling of the drafter of the (*India House*) despatch towards yourself—one, I need not say, of bitter enmity and prejudice!

I hear you are going, and hope this will at least be in time to say good-bye. If life is granted it is probable that I may not be long after you. . . .

When you go home you will not fail to go and see my solitary wife. . . . Write me a good long letter before you go.

Yours very sincerely,
H. YULE.

Calcutta,
29th March, 1860.

MY DEAR YULE,

I duly received your note of the 15th on Saturday last, but did not indeed, could not reply until the Aide-de-camp's despatch containing a copy of the paper you had sent officially had also arrived. This came the day before yesterday, and if I had at once written to you immediately on receiving it, which is my usual custom, I think the tone of my note would have astonished even your well regulated mind.

To you it appeared there was nothing to object to "except as taking the opposite side." I am unconscious that the subject on which my letter was written had two sides. Nor do I recognise any side but the absolute truth, without reference to expediency (or even the ghost of such a quantity as expediency) in cases to be dealt with

by me. . . . It would have been to neglect my duty to permit my officers or men to be employed in any way which could, in my opinion, be injurious to their military organisation, habits, and discipline, without remonstrance. My objection to the employment of the men in the P.D.W. was their removal from the control and supervision of their proper officers, and the loss of their military habits. My objection to men and officers being employed in that department under its existing system, was that they not only would execute work, but be the purchasers of the materials and the paymasters for all the expenditure connected with it. It was known that these were my objections; and the morning we arrived at Barraitch, while on the march there, Lord Clyde gave me a private note from Lord Canning to him, in which a wish for our assistance in creating cover for the troops was expressed, together with a willingness to meet "*my prejudice*" in every way, and to give up a district to us. Lord Clyde suggested that I should give him my views in a private note, and my tent had not been pitched an hour before I took him such a note.

In the afternoon of the same day an official letter from the chief of the staff asked me to make some suggestions by which our Corps could be employed, and immediately I wrote, in reply, the letter which has been quoted as evidence of the "rigidity of our regulations, and our unfitness for employment" here. I consulted two officers with the force, well able to form an opinion on the subject—one a civil officer, the other a very active and intelligent commissariat officer. Both told me that what I proposed was easily practicable; and one, that he thought the Indian Government would be greatly obliged by a suggestion that would enable the present objectionable system of the D.P.W. to be departed from. To vouch for the circumstance under which the letter selected for quotation was written, there are other letters of mine suggesting the employment of my people, which might have been quoted and that could not have been similarly commented upon. But they very probably were not known to you.

Lord Canning considers the grounds of my objection to the D.P.W. system of executing works "*prejudice.*" To me it seems that the first principles of organisation for an executive department are violated by its regulations. I should never think it necessary to try to trace cases of corruption and dishonesty with it. With

that organisation they must exist, and largely. Doubtless the higher functionaries of the Indian Government are men of integrity, but after reading the financial statement in the *Gazette* in the early part of 1859, when there were difficulties about borrowing, nothing can convince me that there has not been corrupt action among public officers by dealing in the loans with the advantage of their official knowledge. Be sure that where the system facilitates corrupt conduct, corrupt conduct must exist. It is slowly introduced by the worst and weakest. It is extended gradually by example, and at last he who shuns the temptation is the exception.

But you don't want an essay from me on these things. I believe that the arrangement I proposed for carrying on works with my people will one day, and at no long distance, be the system for Government work here.

I hope to get away by the next steamer on Monday, the 9th April, and to be in London about the 14th May, when as soon as the tailor has rendered me presentable I will present myself to Mrs. Yule and abuse her husband to her.

I suppose you will get this at Simla, a place that will always be remembered by me with a kind of affection. I hope Lady Canning will like it.

I am afraid to charge you with messages to those who will be there whom I like. But you will see several whom I really like very much indeed.

If I don't get away by the 9th, you will have time to answer. Perhaps the safest way will be to direct to me, care of Messrs. Grindley & Co., Calcutta; if I am gone they will forward your letter by the next mail.

Sincerely yours,

H. D. HARNES.

Camp Roopur,

April 5th, 1860.

MY DEAR HARNES,

If the result justified regret for an act right in itself I should regret having written to you the private explanation which I did write the other day.

What was the fact? A public despatch which I had drafted had been misrepresented to you. That you, an old friend, might be speedily undeceived, I immediately wrote to you privately at the same time that I publicly sent you a copy of the paragraphs which had been misrepresented.

In reply I receive . . . a re-arguing of the matter

of your Oudh proposals, and a general implication of corruption in the service to which I belong, without the slightest allusion to the real object of my note, which was the correction of a misrepresentation.

The letter misrepresented was, as you now know, a simple, courteous, and straightforward statement of facts, not one of which you impugn; nor can the "taking the opposite side" to which I referred, simply consisting in an expression of opinion that there was no machinery in existence, or capable of being readily created, for carrying out your scheme, that therefore your scheme was inapplicable, and if that scheme was an essential in the employment of the Royal Engineers, they had better be withdrawn.

. . . As to there never being two sides to any question before you, I can only understand this to mean that on any question *your* opinion must be the *right* one. I have no intention of again discussing your proposals. I believe Lord Clyde and Mansfield considered them impracticable. So did I. But I gave no opinion, and threw no obstacle in their way. I referred the matter to the head of the Government of the Province, Sir Robert Montgomery, as I was ordered to do, and he declared that they could not be carried out. I then had no reason for reserving my opinion that I entirely agreed with him.

As to the desirability of separating accountability for money from the supervision of work, permit me to assure you that we did not require that to be pointed out to us. Its present practicability is another matter. No Engineer officer in India could be averse to a change which would convert arduous and harassing duties into the comparative rose-bed which your scheme would afford him, could he see his way to it.

Whatever that reply might have been on the spur of the moment which you withheld, I thank you for saving me *more* pain and surprise. Your present letter has pained me sufficiently, if it has not greatly surprised me.

In conclusion, let me say distinctly that I believe the great majority of the Indian service to be just as honourable as yourself, and the body quite as pure as any body of the public service in England. I refer specifically to the officers of the Engineering and of the Civil Services, to whom you appear chiefly to allude. Finally, you will probably some day or other discuss these matters with Collinson, the only other officer of your Corps whose good opinion I am at all interested in possessing, and I

value it very highly. If so, I ask you to show him the public extract, these two letters of mine, and yours which I enclose for that purpose (and in no other meaning).

Hoping to meet you some day, when we shall have more agreeable subjects of intercourse,

I am, yours very truly,
H. YULE.

Colonel H. D. Harness.

About the same time the subject of this memoir, after perusing a report written by the Commandant of Engineers in the Bombay Presidency on the subject of the proposed amalgamation, wrote as follows :—

“ 1st. The supposed disadvantages as to rank and position of the officers of his Corps in comparison with officers of R.E., in consequence of the difference in the organisation of the battalion in the two services ; and

2nd. The disadvantageous position of a Commandant of Engineers in the Indian Service, in comparison with the Commandant of the Royal Engineers, viz., Inspector-General of Fortifications.

If the letter of the Commandant of Engineers had included any other subjects, I should not have presumed to offer an opinion on them. The rank and position of officers in the British Army, as in the armies of all the great military Powers now existing, are dependent on the will of its Sovereign, and it is repugnant to the sense of military discipline in which English officers are trained to consider in what manner individual interests are affected by the commands of their Sovereign.

Adopting the figures given by the Commandant of Bombay Engineers for the Indian Service, and writing from my own knowledge of my own, the facts for a comparison stand thus :—

The battalion in the R.E. has no real existence ; in the R.A. it does exist, and the proportion in which the officers of the R.E. are divided under different ranks are the same as in the artillery. A certain number of the general officers, regulated by the strength of the Corps, who have passed from the active list of the Corps on becoming major-generals, receive emoluments which attach to the command of a battalion, and their names are reinstated in the Army List as Colonels Commandant, but no duties attach to their position. They no more form a part of the active Corps than the other general

officers who have been promoted from it, and have not yet obtained an increase of income by being nominally appointed to a battalion.

The active list of Royal Engineers, when complete, comprises :—

15 Colonels.
37 Lieutenant-Colonels.
120 Captains, divided regimentally as 1st and 2nd in equal numbers.
180 Lieutenants.

Total 352

The respective percentage proportions therefore are :—

Colonels	4'26
Lieutenant-Colonels	10'51
Captains	34'09
Lieutenants	51'14
	<hr/>
	100

And for the Indian Service (from the letters of the Commandant in Bombay) :—

Colonels	3'71
Lieutenant-Colonels	7'41
Captains	44'44
Lieutenants	44'44
	<hr/>
	100

If the rate of promotion, by death vacancies, by retirements, and promotion to major-general, be the same in both services, the subaltern in the Indian Service has the advantage of a quicker promotion to the rank of captain, which opens to him the whole field of military honours by rendering him eligible for brevet rank. On the other hand, the officer of the Indian Service on the same supposition will be longer obtaining the rank of a regimental field officer.

With reference to the second subject—the disadvantageous position of a Commandant of Engineers in the Indian Service, in comparison with the Inspector-General of Fortifications—it is evident that the position and duties of Inspector-General of Fortifications are entirely misunderstood.

The Inspector-General of Fortifications is the custodian of all lands and buildings held by the Crown for military purposes in every part of the Queen's dominions, except that part in which her Government has been administered by the East India Company.

He is responsible for the designs and execution of all permanent military works throughout the same extent of the British possessions.

He is the adviser of the Secretary of State for War, for the time being, as to the probable cost of military works under consideration, and as to the grants to be requested from Parliament on account of such works, or for works already approved and in progress.

It is in addition to these duties that he acts as Commandant of the Royal Engineers, and is responsible for the maintenance of their organisation and discipline; the whole of the duties they perform being equally considered military duties, and being carried on under his orders as their proper military superior.

16th May, 1859.

H. D. H."

The above was written at Calcutta, just previous to embarkation in the P. and O. s.s. "Simla," in which ship Colonel Harness was accompanied by Lieutenants Beaumont, Edwards, Webber, and Festing.

His remarks, made after his return to England, on the report of a Committee as to the then proposed amalgamation of the Royal and Indian Engineers, which was subsequently carried out, already referred to in this chapter, are appended.

"I have read that part of these papers applicable to the amalgamation of the Royal and the Indian Engineers, pp. 17, 18, 19, with attention, and cannot concur with the observation of the Committee 'that even without such revision (of the Indian system of public works) there is no insuperable obstacle to the employment of the officers of the Royal Engineers in India upon all duties now taken by those of the Indian Corps,' nor with their opinion in a previous paragraph, 'that the principle on which we have proposed to unite the Indian Artillery with the Royal, will be found to be equally applicable to the Indian and Royal Engineers.'

"In the two paragraphs which follow that from which the last quotation is made, the Committee state correctly the difficulty presented to this amalgamation by the Indian system of public works. As it appears to me, however, that they could not, if they properly appreciated that difficulty, have arrived at the conclusions which they have recorded in the passages above quoted, it is my wish to render the objection to such amalgamation under

the present circumstances more clearly comprehensible, with a hope that when understood it may be found possible to remove it.

“It is proposed to apply the same principle in amalgamating the two Engineers Corps as in amalgamating the two Artillery Services. The duty of the Royal Artillery in India is the same as in every other part of the globe. The Royal Artillery will become part of the force in India under the same regulations by which they are everywhere governed. But the Engineers in India are, with insignificant exceptions, the servants of the Civil Government of that Dependency, carrying on the public works under regulations entirely different to those by which we are guided, and so completely as civilians that military rank is ignored, being superseded by their position in the Department of Public Works. There is no analogy whatever between the amalgamation of the two Engineer and that of the two Artillery Services.

“When an officer of Royal Engineers is separated from the military duties of his Corps, to be employed by a civil department, he is *seconded* for a limited period; and Royal Engineer officers wishing to be employed in the Department of Public Works of India, might lay aside their military position for a limited time as they would if lent to the Board of Works in Ireland, or the Railway Department of the Board of Trade in England; but it cannot be right to include the duties of the Department of Public Works in India under its purely civil administration among the legitimate duties of our Military Corps, which is the necessary result of an amalgamation on the principle suggested.

“But there is a more important objection, I believe, that almost all persons who have considered the administrative arrangements suitable for the execution of works will condemn those adopted by the Public Works of India, and that the officers of Royal Engineers will generally agree in the opinion that it is not right to allow any of our officers or men to be employed under those arrangements. The Engineers in India design the works, purchase the materials, and pay the labourers. If the expenditure on a work does not exceed the estimate by more than a given percentage, the Engineers are the auditors of their own accounts. In the payment of native labourers, if not supplied by some sort of contract, any trustworthy voucher for the sums paid cannot be framed. And I have seen a very large number of workpeople paid individually, as they delivered earth or

other material from baskets of cowries which are current as money.

“In conjunction with these arrangements, the public account of each Engineer is always in an unsettled state, and generally to a large amount.

“Dishonesty must exist under such a system to an extent that cannot be estimated.

“No officer of Royal Engineers can approve of his Corps being rendered responsible for expenditure so conducted. Moreover, the system is unnecessary. At the place where labourers were paid from baskets of cowries on Engineer account, other work was being executed by the Indian civilians, the works in charge of the latter being intermixed with those in charge of the Engineer. The natural division of the executive charge of works from the financial business connected with them might certainly have been affected here. Nor can it be doubted that if no Public Works Department existed, in India, with a system in operation, we should in taking over the military buildings and works of the country at once establish the same general system on which such works are conducted in all other parts of the world, and that the cases in which it was necessary to make an Engineer officer a public accountant would be as rare and of as brief duration in India as elsewhere.

“It does not appear to me that there should be any difficulty in separating the military buildings and works of India from the public works, and placing them under the same administrative system as that adopted in our dependencies. It is true that the funds are to be furnished by India, but there is nothing unusual in works being executed for a Colonial Government by the Royal Engineer Department. The arrangement is familiar to us all : the funds are paid as required into the military chest by the colony, and the work is carried on in every respect as an Imperial work for which the funds have been voted by Parliament ; and it is surely desirable that the Indian barracks should be subjected to the same consideration in England as all other barracks.

“This is due to the soldier, and the distance is no obstacle. The communication with England from any point of India occupies only five weeks ; as the railways are extended this maximum period will be diminished, a system which is followed for our military buildings in New Zealand and Upper Canada may therefore be adopted in India.

“I find less difficulty in suggesting such a change from

the conviction that the Public Works Department as an Executive Board of Works cannot long exist. The public works of so extensive, productive, and populous a country cannot continue to be carried on under a central board, or to be provided for from the Government revenue. This rich country is without roads, its rivers are unbridged, its watercourses uncontrolled, steam and water power unknown.* The supply of water everywhere dependent on water carriers, and taken generally from open, stagnant ponds. The whole Government revenue of India would not be a large annual expenditure on the public works of that country for many years to come, and as its resources become known to English enterprise, and are directed by minds formed in England instead of India, the character of the duties of a Department of Public Works for that country must change entirely; it must very soon cease to be an executive department."

(Signed) H. D. H.

28th November, 1860.

* It might be thought that the writer had not taken the trouble to make himself acquainted with the public works by which the small body of East India Company Military Engineers had already made their mark, even in remote districts, of the vast continent. I am inclined to believe that he overlooked how much *had* been done by utilising the constructional resources of an ancient civilisation, and, that his mind was rather turned toward the great future available for the energies of the Public Works Department of such an Empire as that of India.—[Ed.]

CHAPTER VII.

COLONEL HARNESS IN 1860-62 ON THE EDUCATION AND ORGANISATION OF THE ENGINEER SERVICES.

By MAJOR-GENERAL COLLINSON.

Memorandum by Colonel Harness on a Report by Colonel Owen, R.E., on the present condition of the Royal Engineer Service, 1860.

“I have read Lieut.-Colonel Owen's observations on the present condition of the Royal Engineer Service, etc., with attention, and disagree with him completely. The opinion he expresses appears to me to have been most hastily adopted, without any clear views as to what it is desirable to obtain in arranging the education and organisation of the Corps; and as his paper does not convey to my mind the idea of any principles on these points with reference to which my remarks might be made, I am compelled to criticise his statements, a course I wished particularly to avoid.

“The first five pages need no observations.

“In the sixth he says that Engineer officers, should be instructed in the principles of construction,' and 'complete their education, where they now commence it, in the actual practice of their profession.' Those principles of construction which are universal our officers ought to be taught theoretically; they are intended to be, and generally are taught them by their mathematical professors at Woolwich—of course, as with everything that is taught, with various success—but I remember a design being made at Chatham by a young officer, lately joined from the Academy, who can have been but very little junior to Colonel Owen, and

who must have studied at Woolwich about the same time, which was greatly praised by the most eminent Engineer of our age, who saw it at Chatham, because it proved an accurate knowledge of mathematical principles. He told me he had never before met with a design from a young man in which so perfect an acquaintance with them was exhibited.

“It is not true to say that our officers only commence their education when they begin to practise their profession. If the preliminary education at Woolwich did not exist it would be impossible for them to go through even the limited professional course at Chatham within any reasonable time; and when they leave Chatham, having only the knowledge gained there and at Woolwich, there must be few who cannot make an accurate survey and contour of the ground, and draw upon the plan a work of fortification in accordance with the instructions of the commanding officer, and measure the quantities of the different descriptions of work required for it. There must be few who could not reason on the disposition of a proposed truss or other piece of framing, or determine whether a drawbridge would be balanced in all positions; although they, of course, could not, and ought not to be expected to be able to give the practical directions for the execution of the different descriptions of artificers’ work.

“Pages 7 and 8 contain assertions of deficiency; at page 9 we have what is meant by them, viz., that few could carry out a building of any magnitude or difficulty; few with their own hands complete the drawings necessary to guide a contractor in his operations.

“We can assert and show that works of considerable magnitude have been successfully and economically executed, and I believe confidently with a smaller proportion of failures than may be found in civil works. That every officer should be able to complete with his own hands, and from his own practical knowledge, working drawings for a contractor, in all and every case, under all the varying circumstances in which he may be required to act as an Engineer, is simply impossible, and not only ought not our education to be arranged with a view to this result, but it is my opinion that no education could produce it.

“I do not know what Colonel Owen’s experience may have been with reference to the statement in page 10; each must speak by his own. At Bermuda, where the first years of my career were passed, each design for the

works of defence that was sent home—and there were some extensive designs—was drawn by an officer under the direction of the Commanding Royal Engineer; and the estimate for each design made in like manner, and so far as I have been acquainted with other stations, the same course has prevailed. But it is not so with trifling works, such as small additions to existing buildings; and but few of our officers probably take an interest in ornamental architecture or in house building generally, beyond what is necessary for erecting a commodious barrack substantially, the design for which must be varied according to the climate and other circumstances of the country in which it is to be built, including relative prices and qualities of labour and material, all which vary greatly among our several foreign possessions. In England, where the mode of building suited to the circumstances which prevail has been brought to great perfection, we naturally adopt to a great extent the aid of clerks of works who have been trained among English builders, and this course appears to me to be far preferable to that proposed by Colonel Owen, by which our military Engineers would be educated completely as English builders, and be then such builders only.

“At page 11 Lieut.-Colonel Owen justifies his remarks by his experience of the deficiency of individual officers. Among three hundred officers it would be strange if there were not different degrees of ability and energy and varieties of qualifications. We must in all cases when employing a staff of educated men, employ each to the best of our judgment according to his qualification; and it is quite possible that the officer to whom Lieut.-Colonel Owen alludes, whoever he may be, that was deficient about laying out a work of fortification upon the ground, was very well qualified with respect to other professional subjects. It has been my lot to meet with a very large proportion of my brother officers, and I have met with very few indeed who were not well-fitted for some of the duties of their profession.

“Nor am I willing to observe on the following portion of this paper which relates to the organisation of the Corps. I believe my individual opinions on that subject to be so well known to the Inspector-General of Fortifications as to render it quite unnecessary for me to detail them here, and will therefore limit my observations to the suggestion made by Colonel Owen for the constitution of a Works Department, to superintend the employment of our Corps on military works, and still

further reduce our opportunities for acquiring practical experience. It is evident to me, notwithstanding the confidence with which he expresses himself, that the organisation of such a department is not clearly conceived in his own mind, but that the Indian Department of Public Works is regarded by him as a model which may guide him. In India I objected to the men and officers under my command being employed in that department on account of its organisation, and in sending home a copy of my correspondence on that subject wrote to the Deputy Adjutant-General of Royal Engineers.

"I have only to add that Colonel Owen must have known, and ought to have recognised when speaking or writing, the strong desire there is among the officers of Royal Engineers to improve the education of their own body.

"The existence of Chatham as a school of application is due to the representation of one of our body, and its deficiencies ought rather to be attributed to the difficulty of obtaining authority to make alterations involving expense than to any want of appreciation of deficiency among ourselves.

"Within the last few years also the great increase in the number of young officers and soldiers at the Chatham establishment may have rendered a change in its organisation desirable, with respect to all of which I hope to be able in my present position to make some clear and definite propositions. The publications of professional papers of the Corps, the compilation of the Aide Memoirs, the foundation of Corps libraries of professional works at our stations, have all sprung from ourselves, and are evidences of the general desire among us that our Corps shall preserve its character, and shall keep pace with the progress of the age in its collective information."

H. D. H.

MINUTE PAPER BY SIR JOHN BURGOYNE.

The Secretary of State for War.

We are all quite ready to admit the propriety of taking steps for the improvement of officers of Engineers in the building and constructing arts; but I concur with General Foster and Colonel Harness in the opinion that Lieut.-Colonel Owen's proposition would be most injurious to the public service, that it would greatly

lower the efficiency of the Corps as a military branch, and would not provide effectively for its intended object.

The officers being encouraged to obtain a competent amount of the general principles of buildings and works, with the employment of a good set of practical Clerks of Works, appears to me to be the best system, and has not failed up to this time to anything like the extent urged by Colonel Owen; and it will work better by stimulating the officers to obtain still more minute knowledge of the business, and by studying to maintain a proper class of Clerks of Works by a due regulation and amount of encouragement.

19th September, 1860.

J. F. B.

Reply to Sir John Burgoyne.

I am very glad that Colonel Harness has seen Colonel Owen's paper, because he has a view, perhaps exaggerated, but still the view of an able man on certain defects in the education of our Engineer officers. His opinion may be expressed in one sentence. The education is not too theoretical, but it is not sufficiently practical.

It is true that architects and civil engineers do not themselves carry out the details of their own plans, but they may often, perhaps generally, have begun by practically working out the details of others.

In the Navy formerly the master navigated the ships, and the officers who had learned the theory had not learned it practically; now they do the work themselves,* and are not the less gentlemen on that account.

My acquaintance with the subject of the education of the Engineers is necessarily very slight; but in inspecting barracks with the Sanitary Commission I was very much struck with the fact that often, if you wanted to know anything about the new buildings constructing or constructed, it was not the Commanding Royal Engineer or his subordinate officer, but the Clerk of the Works who could tell you all about it. He had the real control, because he had the knowledge, and he had the interest in the work because he had the control.

Surely in many cases on service, where there are no contractors nor Clerks of the Works, but sappers or even line labour, the Engineer officer ought to be able to execute, as well as plan and direct in the execution, the unskilled labour at his disposal.

At this moment we have a vast amount of fortifi-

* This paragraph was in Colonel Harness's handwriting in pencil.

cations to execute, but in ordinary times the construction of civil buildings is the chief work of the Royal Engineers, and even now at the majority of stations this is the case. Besides which there is nothing which is learned in the construction of civil buildings which is not also useful in the construction of military works.

I hope Colonel Harness will give the subject full consideration in dealing with the studies in the school of application at Chatham.

SIDNEY HERBERT.

THE COMMITTEE ON BARRACK WORKS, 1861-2.

A Committee was formed in 1861 to report "as to the measures that should be adopted in order to simplify and improve the system under which all works and buildings, other than fortifications, connected with the War Department are constructed, repaired, and maintained, in order to give a more direct responsibility to the persons employed on those duties."

Its composition was such as to ensure a report quite independent of Army, Corps, or even military feeling; one staff officer, two officers of Royal Engineers, an experienced barrack master, a leading contractor, the Accountant-General and the Surveyor of the War Department. And the persons examined were of various occupations and positions more or less connected with building, who gave their opinions freely and without reserve. That the report was favourable to the continuation of the existing organisation, that is of keeping the whole of the constructive work of the War Department under the Royal Engineers, with some modifications in the details of organisation, is a strong confirmation of the opinions maintained by Colonel Harness and other officers of the Corps.

Extracts from Report, 1862.

67. "The Committee, after careful consideration of this important subject, are of opinion, upon the ground of public policy, that the construction and maintenance of works and buildings under the jurisdiction of the Secretary of State for War, should continue to be conducted by the Royal Engineers as a military corps."

68. "They are of opinion that it is necessary for the maintenance of the military discipline and organisation of the Corps of Royal Engineers upon the one hand, and for the efficient and economical conduct of the works on the other, that the Inspector-General should be placed in a military relation to the Commander-in-Chief."

75. "The Committee are of opinion that it is undesirable to perpetuate a large permanent staff of Clerks of Works. It may, however, be necessary to have a few appointments of a permanent character ; but, as a rule, it would be advantageous to the public service if Clerks of Works were employed for particular and special works, as is the practice with civil architects. For the superintendence of repairs and minor services, non-commissioned officers of Engineers might usefully be employed."

78. "The appointment of an officer of Royal Engineers to the charge of important works should carry with it such 'charge pay' as may from time to time be determined by the Secretary of State for War and the Commander-in-Chief, and the same principle should also apply to the civil staff."

(Signed) PERCY E. HERBERT, Colonel.
 E. C. FROME, Colonel, Royal Engineers.
 DOUGLAS GALTON, Captain, Royal Engineers.
 JOHN BUCKLEY, Barrack Master.
 S. MORTON PETO.
 WILLIAM BROWN, Accountant-General.
 HENRY A. HUNT.

Evidence of Colonel Owen, R.E.

1025. I think that Her Majesty has, in the Corps of Engineers, as able a body of men as there is in the country as a body ; and if they are only given fair play, and used in a proper manner, I think they will give the country every possible satisfaction.

1061. I can only say that since I have been at Plymouth many of the designs and specifications for all kinds of work have been drawn up by Engineer officers.

1128. With your knowledge of the qualifications of Engineer officers as a body for that class of work, are you of opinion upon the whole that the work would be better done by a civil architect than by the Royal Engineers as that body is at present constituted?—If you take the best qualified officer for a particular purpose in the Corps and put him to design your barrack, I think he

will design it as well as most civil architects ; but it is not fair to select your architect with the greatest care and pit him against the first officer who turns up.

Evidence of Colonel Harness, R.E.

1182. I brought up with me a letter upon the subject, which I wrote but never sent, when we were thinking what officer we should get for the duty, knowing that the authority would come to me. I never sent it because a change took place in my mind as to the officer. The note has never been used, but it shows my view as to the architectural course. I have taken out the officer's name, and will read the letter to the Committee.

“ We want, as you know, to have an officer appointed here as instructor of architecture and construction, and expect confidently to have the appointment of an officer for that purpose authorised. The present architectural course which the young officers pass through with the clerk of works is limited to the work of a London house-builder. We want the subject taken up in its most general sense ; the materials used in construction, strength, and durability ; the effect of varying prices of labour and materials, and of various climates on design. Then the various processes under different circumstances of erecting a building, from foundation to roof, and of the fitments required for it. Examples as numerous and varied as possible, of designs for the different descriptions of military buildings in different circumstances. The elements of price in the general descriptions of work required for them. The measurement of work of each kind. The preparation of the estimate. The principle of the arch, of retaining walls, of wood and iron bridges. At present the officers do not design anything, nor make any original accounts or estimates. I propose that, as part of the survey course, each officer shall design a work of defence upon a contoured site ; and that under the architectural officer, he shall design the necessary buildings for that work, and measure and estimate and prepare working drawings for as much of such buildings as will teach him effectually to do that work. It is hardly necessary to open my ideas out more fully ; for whoever comes must have great latitude given to him, and in communication with me work out a course that will satisfy these notions at least, and give the officers knowledge enough to be at once useful to the Com-

manding Royal Engineers wherever they go. Perhaps, in connection with the architectural course, it may be desirable to establish model workshops."

1183. Chairman: "What experience have you had during your service in the Royal Engineers, either in charge of a district or sub-division of a district?"

"My service has been a very varied one; immediately on leaving Chatham I went to Bermuda, where there were very large works, and where we could have no contracts; the work was done without any civil labour; we had two companies of sappers; we got from 150 to 200 men from the regiments, and about 500 or 600 convicts, and with those we carried on all the work. When I first went there there was a Clerk of the Works, but I never knew him do anything except in the office in keeping the books and accounts; he never made a design or an estimate, and was never seen on the works. That was my experience of Clerks of the Works there: for a long time we were without any; at last we had one, who is now with Colonel Frome, in Ireland, Mr. Sands; he was the first Clerk of the Works that I ever saw go on to the works at all, and he occasionally did go on to the works."

1184. What was your rank at that time?—I was a lieutenant, and Lieutenant (now Colonel) Nelson and I made many designs, and a very large number of estimates, including much cast and wrought iron work, and that was after coming straight from Chatham.

1201. With regard to large designs for barracks and large works, called civil buildings, but which are in fact military buildings, do you conceive that the best plan would be to have the designs prepared, as a general rule, at this office, or at the office of the Commanding Royal Engineer of the district?—Certainly, I should say, at the office of the Commanding Engineer of the district. I cannot conceive a worse arrangement than that of centralising the administration of military works in London.

1207. You asked whether our officers could design. I suppose that there is no subject more difficult, or requiring more genius on the part of a person making a design, than a design for the occupation of ground by defensive works, and no doubt very few will be able to do that well; but men who can do it well will be able to design any building.

1221. Is it not desirable to introduce the civil ingredient into the service?—Certainly not, because exactly to the extent that you do that, you diminish the power of

giving experience to your own officers, and those officers are required to be able men in a time of war.

1222. A time of war is the exception?—But it is one that we have to prepare for.

1223. Therefore it is worth while to misapply talent and labour for forty years for the sake of the exceptional five years?—Undoubtedly; in the same way as we keep up a large number of trained men as soldiers, in order that they may be ready to act as a military body under uniform discipline and under a proper system the moment danger makes it necessary. And a part of every military force must be a working Engineer force; and that part must be trained and ready to act, and not only must it be ready to act, but to act as a combined part of that military force; and its habits of communication with the different people for and with whom it works must be consistent, settled, and understood. They must not be left to be found out in a week or a fortnight, but must be understood the minute they are under orders, and if you take them away from military work, and employ them elsewhere, they will know nothing of one another.

1226. Chairman: When you say that you consider it advantageous to the Government so to employ them, are you speaking solely with the view to preparing them for a time of war as a matter of policy, or do you consider that it is a fair financial arrangement for the Government to make?—I am thinking only of making the Corps efficient for all its duties, which are not only required in a time of war, or in England only; but in peace, and abroad, and abroad they must design those buildings. I do not see how it can be arranged that the buildings for foreign stations should be designed at home.

1249. Do you not think that the construction of fortifications and works of that kind are sufficient to engage the whole of the attention of the officers?—Yes, if we had enough of them.

1250. Do you not think that the attainment of proficiency in that particular branch of engineering requires entire and exclusive attention on the part of the student to that particular subject?—Yes; but I think that we look at the question quite differently; we want our officers necessarily—and I don't see that there is any mode of avoiding it—to be able to take up almost every subject that falls either to the Engineer or to the architect. An officer may be sent to a large colony where there will be only four or five of our officers, and any engineering question may arise, and whatever it is, it

will go to him, and he must be able to deal with the principles of that question: and the necessary consequence is, that you must spread his mind over many subjects, and cannot take him into the executive details of one of them. If, therefore, he has to execute one of them, he must look to the practical men who have been practically employed upon that one thing to work under him; he has got the principles of the subject, but not experience in the thing itself; he sends home, and he says I want a Clerk of the Works whom I propose to employ on such a description of work, or a Foreman of Works who has conducted such a description of work. I want one who has laid foundations with the diving bell, or I want one who has been a good deal employed in driving piles. The officer sends home for such men, and they are sent out to him.

1283. Chairman: Is there anything in the military organisation of the Corps to prevent an officer who has shown that he possesses special talent for building barracks, from being detailed for the duty whenever any large barrack is about to be constructed?—Not that I am aware of. The Inspector-General ought to be able to put his hand on the officer best fitted for the duties that he wants executed. But there is a great evil at the present time, and that is that we have not got a Head. The Inspector-General of Fortifications is the head only of our civil duties, he is not our military head; formerly the Inspector-General of Fortifications was the military head of the Corps, and our Engineer duties were as much our military duties as the duty on parade. Now these things are divided, and as long as that is so they will never go on well together.

1287. Is it your opinion that it would be very disadvantageous to have a different system at home?—I think that whatever system we have should be general, universal, and simple, and that to find a diversity of regulations as we change our stations would be making it complex, and doing away with simplicity.

1288. Do you give that opinion with reference both to military efficiency and to economy in the public expenditure?—I think first of military efficiency, and I believe it is perfectly compatible with economy, but I think that military efficiency must be the first.

Evidence of Captain Fowke, R.E.

1337. Might other young officers of Engineers make themselves equally competent, and without difficulty, to prepare such designs

as you prepared there?—I think that almost all young officers of Engineers might do so, if they were obliged to rely upon their own resources, considering the very high class of education that they have received beforehand. You take the greatest possible pains to sift them through two or three examinations, and you give them the highest class of mathematical education, and all that they are wanting in is a little practical knowledge, which is a comparatively very small matter, and could very easily be obtained afterwards. You do not want to make them architects, you only want to make them constructors; and their education, I may state, is far higher than that of the class of men from which constructors or even architects are ordinarily obtained.

1340. You constructed also a barrack at Devonport, called the Raglan Barracks?—Yes; a large barrack for 2,000 men.

1341. Did you prepare all the drawings?—All the drawings; and almost all with my own hand, which, of course, took a long time to do.

1342. Have you been engaged in any civil employment since that time?—I was employed as Secretary of the English part of the Paris Exhibition. I had charge of all the machinery, the collection, erection, and keeping in a proper state of efficiency for exhibition all the British machinery in the Paris Exhibition. I have since been employed as engineer and architect to the Science and Art Department of the Committee of Council on Education.

1350. Will you favour the Committee with your views, in a financial point of view, as to whether it would be good economy to employ the Royal Engineers in the construction of and repairs of barracks, without looking to the policy at all; I put the question to you from your experience both as a civil architect and a military architect?—My own opinion is, that barracks could be constructed and repaired under a proper system, at least as cheaply and efficiently by the Royal Engineers as by any other body of men, and perhaps more so. My reasons for saying so are these: first of all I believe that economy would be effected, as I said before, by combining barrack and fortification construction under the same hands; secondly, the Engineer being a soldier is more intimately acquainted with the requirements of a barrack. And I think, to begin with, that a body of men highly educated, possessing theoretical knowledge and mathematical knowledge, are more likely to make clever constructors than men who have not commenced with such advantages. As I said before, you want constructors, and not architects; I would not confuse the two at all. I think that men with the advantages of such a liberal education would be more likely to take advantage, for instance, of the different points in sanitary science, and when you get them into different positions where strange materials have to be made use of, their chemical and geological knowledge would then come into play. I think that all you want to give them is practical knowledge, which I believe can be most easily obtained. There is no profession extant which exactly meets the requirements of the military Engineer, as to building barracks and fortifications. An architect devotes himself more to artistic than to constructive details, and the actual details of construction as conducted by an architect are, in most cases, left to his subordinates. I may also add, that as all these officers have been from mere boys so carefully trained up in a military school, in strict principles of honour, you have a perfect guarantee against collusion or fraud of any kind. And as you must keep up a force of Engineers in peace time, economy is effected by employing them.

1407. Do you consider it desirable that a civil architect should be attached to the War Office for the purpose of giving it the benefit of his experience and practical knowledge, with regard to construction and the improvements that are taking place every day, and which Commanding Engineers, generally speaking, are not able to keep pace with?—I think that if you carry out the system which I advocate properly, you will be able to pick out an officer from the Corps of Royal Engineers who will do that particular class of work, that is, barrack work and fortification work, to which he has been brought up all his life, probably better than a civil architect, who has not been accustomed to such work, and who would be new to it; and then it must be remembered that you would be training Royal Engineers, if you follow out the system which I advocate.

1452. Do you consider that the main point to be kept in view in the conduct of these works is, that of making the Corps of Engineers most efficient?—Yes; and I would also add, that I believe that is not incompatible with doing the work cheaply and efficiently.

Evidence of Lieut.-Colonel Strachey, I. E.

4037. Will you be good enough to state generally to the Committee your view as to the advisability, or otherwise, of continuing the superintendence of barracks in the hands of the Royal Engineer Corps. This, of course, opens out considerations both of financial and public policy, as, of course, the keeping our army complete in its organisation in time of war, and to meet the requirements of our colonial system, cannot be altogether put out of view?—My own impression is that the barracks certainly ought to be left in the hands of the Royal Engineers. I look upon the Engineer Corps as a body of scientific officers, who are intended to be available in time of war for the purposes of carrying out all those sort of duties which are ordinarily performed by civil engineers in peaceful times, either when an army is in an enemy's country, and when ordinary civil resources are not available, or in the case of a beleaguered garrison, and so forth; and in order to obtain a body of officers that shall at all times be available for those duties, and at the same time fully competent to perform them in a thoroughly efficient manner, it is necessary in peace time to keep them employed on these sort of duties. And, of course, the more varied their occupations are within the particular sphere of the duties I am speaking of, the better for the State, and the more likely you are to be able, when an emergency arises, to find exactly the sort of men that you want. Besides which, employment upon duties of this nature—that is, engineering works generally—makes men shifty, and tends to develop in them capacities to meet emergencies, which otherwise they would not possess. I think that it is for this reason our Public Works Department in India has been found practically to answer exceedingly well as a school for our military Engineers. The experience that is got in purely civil engineering works has brought up for us a body of officers who, I venture to say, have shown themselves in time of war not to be surpassed by any body of military Engineers in the world, so far as they have had an opportunity of showing their capabilities. Therefore, I should say that it is most desirable to keep your Engineer officers thoroughly acquainted with all the varied duties of engineering. As to the specific question of barrack construction, I think that Engineer officers, being soldiers, and being more or less in the

company of soldiers and attached to them. know a great deal better about the requirements of troops, and the way in which barracks should be arranged, than civilians do ; and I think that the actual carrying out of any system, either of barrack construction or of maintenance, is much more likely to be efficiently carried out in their hands than if you put it in the hands of civilians ; the Engineer officers will take more interest in it, and appreciate the thing better.

Plymouth,

September 7th, 1862.

MY DEAR HARNESS,

I wish I could think with you or get you to think with me about the Clerks of Works.

I have thought and have had opportunities of observing much upon the subject.

You say that "The clerks of works of builders or the assistants of an architect are really practical mechanics." I have questioned architects without end upon the subject, and I do assure you that they do not depend upon assistants for their details. In a large business the details are left to pupils, who are learning to be architects, or clerks who have not succeeded in becoming so ; but the master who wishes to succeed must be able to draw out to a working scale and correctly specify the minutest details.

A General must have learned the goose-step, though he need not be always practising it ; and so must we. If we wish to rise we must master the very elements of our profession. This is not only necessary in barrack works, but in the field. In the Crimea I was quite humiliated at seeing with what promptitude and neatness the French officers completed their arrangements for economising water, while we went blundering on until we got the assistance of Newsome, who had been a civil Engineer.

It is true we have to think of many things, but our main business in camp or quarters is *to build*, and when a fellow knows how to build, his superior education and intelligence will enable him to do anything.

As long as we have clerks of works to assist the officers, the latter will remain helpless. I find invariably the efficiency of the officers is the exact complement of that of the clerks of works. The officer, if a good one, feels crushed and humbled by the superior attainments of the clerk of works, or by the facility with which he talks of technical matters, and the officer finds it easier to leave the whole business to him.

I have an instance when a young officer has deliberately

asked me to remove the clerk of works and leave him with a sergeant of sappers to manage things.

In the case of R——'s barracks, if the clerk of works was to make the plans, what function was the officer to perform? I gave him a draughtsman to save him from more drudgery, but I wanted him to think about it, and that is just what he did not, or could not, do.

Great as the extension given to the works since I have been here, I have not had one additional clerk of the works, nor will I if I can help it. I make the clerks of the works take all the measurements, making all the estimates; make them, in fact, surveyors.

The good officers like the work and do their share, the bad ones break down.* Am I unreasonable or hard? Are we to frame a system for such fellows as these?

We want a lumber room to stow away a few among us.

I remain, yours very truly,
H. C. OWEN.

* Within seven years the joint signature to the certificate at the end of the accounts for all expenditure on building construction of an officer of Royal Engineers and of a clerk of the works required by the Treasury was dispensed with, and thenceforward the signature of the individual actually responsible for the superintendence of the work on which the expenditure had been incurred sufficed.—[ED.]

CHAPTER VIII.

ROYAL ENGINEER SCHOOL, CHATHAM, 1860-65.

By MAJOR-GENERAL COLLINSON.

The Reform of the School of Military Engineering, Chatham.
1860-65.

IN 1860 Colonel Harness was appointed Head of the School of Military Engineering at Chatham, which was then called "The Royal Engineer Establishment." This school was first formed in 1812, for the purpose of teaching both officers and men the practice of the various duties which they might be called upon to perform in time of war. Under Colonel Charles Pasley from 1812 to 1841, the school was brought to as high a condition of practical efficiency as was possible at that time, and some other courses of instruction bearing upon other duties of the Corps, such as building and surveying, were added.

The extension of civil engineering, and the requirements of the Crimean War, stirred up the feeling that further instruction in the science of constructive and mechanical engineering was necessary to keep the Corps up to the level of the science of the day; and it was intimated to Colonel Harness that the authorities of the War Office and Horse Guards desired to receive from him his opinions as to the reforms in the school necessary for that purpose.

His first memorandum on this subject, dated 5th November, 1860, is given below; and though the circumstances made it

short and general, it illustrates well the habit of his mind when taking up an important subject of considering its general purpose, origin, and growth. The headquarters of the Corps of Royal Sappers and Miners which before that time had been at Woolwich, were moved to Chatham in 1860; an arrangement which, though it added to the unity and efficiency of the Corps, by concentrating all its interests in one place, created at first some difficulties in arranging for the combination of the scientific and military instruction established by the reforms of the next few years. The letter from Sir J. Burgoyne on page 216 gives his views respecting the proposals made by Colonel Harness, and the extracts from the letter of Colonel J. W. Gordon, who had lately been Deputy Adjutant-General for the Royal Engineers at the Horse Guards, show the opinion of a very earnest and high-minded soldier on this important subject, as well as his feeling towards Colonel Harness.

Royal Engineer Establishment,
5th November, 1860.

SIR,

Having been verbally informed by the late Deputy Adjutant-General of Royal Engineers that it is the wish of H.R.H. the Commander-in-Chief to receive from me, as early as possible, suggestions for the improvement of this establishment, I now forward for submission to His Royal Highness the following statement.

If the views, with which the changes proposed in it are recommended, meet with approval, I shall be prepared to carry these changes into effect, or, in such cases as may be requisite, to submit more detailed suggestions with that object.

The Royal Engineer Establishment was instituted in 1812 for the instruction of Engineer officers and soldiers in field duties, but it soon became a school of application in a more extended sense for the officers of Royal and Indian Engineers. About twelve years after its institution a course of practical architecture was added to the subjects of study; and in 1833 the course of surveying, to which those cadets who were candidates for the Royal Engineers were at that time required to devote their exclusive attention for a period of from eight to ten

months, before being gazetted, was transferred to the Royal Engineer Establishment. Under the last Royal Warrant relating to the establishment, its objects are described as including surveying, topographical drawing, and practical architecture; and, since the date of that warrant (1st July, 1850) instruction in photography, electric telegraphy, and chemistry, has been made available to some of the men and officers.

In fact, the Engineer soldiers of the British Army are intended to be trained to the extent necessary to afford a practical working staff to the Engineer officer wherever he may be placed, and whatever description of work he may be required to do. Their military organisation and training fits them for movement and co-operation with other military bodies; and at the same time, what is yet more important, it produces order and a perfectly known and recognised chain of subordination in the arrangements for the execution of a work from its commencement by labourers of any description. In the company of Engineers—which must be the unit for such a force, but of which the strength and composition might be varied*—should be found, and generally may be found, the master artificers and the workmen for small, or the nucleus for large workshops of the ordinary trades; also clerks trained to our system of bills, pay lists, check lists, and distribution states; surveyors competent to make chain surveys of small extent, to take a section, and to trace simple designs upon the ground; and draughtsmen able to copy mechanical drawings neatly. While in addition to these qualifications by which the company is fitted for undertaking such works for defence or barrack accommodation as may be required, the whole of the men are intended to be trained as sappers, as miners, and as pontoons.

To effect this was the first and only object of this establishment until the headquarters of the Corps of Royal Sappers and Miners was removed from Woolwich to Chatham. The duties of the headquarters of the Corps are now added to those of the school of appli-

* Considering the purposes for which the men are trained, it is obvious that more than one company of men so trained could rarely be required at one point. The company, therefore, should be habitually regarded as the proper unit of the force of Engineer soldiers; its composition and strength being varied according to the requirements of a station. And it is believed that this might be effected without numerous transfers, by keeping the companies at home at the minimum strength, and completing them when going abroad by men of the trades most required.

cation. Recruits are received and drilled and old soldiers returned here for discharge. The attention of the staff of the establishment has been called upon fully as much for the ordinary training of infantry as for the professional training of Engineer soldiers ; and the time of the young officers of the Corps, for whom a period of eighteen months, devoted exclusively to the objects of a school of application for military engineers, would be but a short time, considering the wide range of engineer duties for which they are to be prepared, is consumed by a variety of regimental duties.

It appears by the returns brought to me every week, that there is not one man among the young soldiers of the Corps at headquarters who is reported by the officer in charge of the field work instruction as a trained sapper. By the annexed report from the same officer it will be seen that the average employment on field works of those considered under his instruction is only from two to two and a quarter days per week, and the instruction, therefore, cannot be continuous, without which its value is greatly diminished. By a return which is also annexed from the officer in charge of the schools, it may be seen that the average attendances of those men who are not considered as recruits, is only $7\frac{1}{10}$ hours per month, and of the recruits $16\frac{1}{2}$ hours per month, or about $1\frac{3}{4}$ and $4\frac{1}{30}$ hours per week, respectively. The period during which a man is included among the recruits is about four months.

The young officers may be assumed to have their time distributed as follows :—

Preparing various projects	130 days
Architectural courses... ..	20 "
Survey courses	150 "
Field works	10 "
Military duties, including rifle drill	120 "
Leave	40 "
	470 days

Thus of a period of between fifteen and sixteen months, which would be too short even if exclusively devoted to their peculiar professional studies, one-fourth is occupied by military duty, which not only takes up their time, but in some cases breaks the continuity of the subject on which they are receiving instruction, by taking them from the class with which they may be receiving it.

The instruction of officers and men is also imperfect from the want of a sufficiency of competent officers

specially appointed for it. The officers pass through their survey course under an able officer, but the number to be instructed has become far too great for one officer ; and now that less time is allotted to topographical drawing at Woolwich than thirty years ago, when it was thought necessary that candidates for the Royal Engineers should, after leaving Woolwich, employ nearly two months continuously in drawing from models as a part of their survey course, topographical drawing ought to be included in its exercises. The first subject for the study of every officer who is to rise above the ordinary occupation of his regimental duties is, in my opinion, the delineation of ground. Without laying very great stress on the value of drawing, I do attach great importance to this study, whatever the result as to the skill acquired may be, because it teaches the officer to think of the features of ground. The projects of demolition, of attack, and for military bridges, are of little value unless looked over and discussed by officers who have respectively studied one or other of these subjects with a view to giving instruction. The number of projects to be looked over is very great, and they can only at present be referred to the few senior officers who may at the time be quartered here, or to the staff officers of the establishment already fully occupied by their special duties. The architectural course is limited to the movement and valuation of the work shown by a series of engraved plates specially applicable to English buildings, and it does not comprise any instruction in the general principles of design, or any original exercises. And the time passed in the execution of field works is evidently insignificant.

While the headquarters of the Royal Sappers and Miners were at Woolwich a sufficient number of company officers were necessarily retained there for the company duties ; but now the companies are in a great degree officered by the young officers under instruction here, an arrangement impeding the improvement of both men and officers.

Such are the consequences which have followed the amalgamation of the headquarters with the school of application, and the recent increases in the strength of the Corps. These changes have rendered an alteration in the organisation of this establishment necessary, and I therefore propose :—

- 1st. That every company stationed here shall be fully officered by officers who are likely to remain with it,

- and who will be interested in its efficiency and improvement ; and that the time of the young officers under instruction may not be taken up in regimental duties to any greater extent than is absolutely desirable for their own information.
- 2nd. That field works be recognised as a part of the recruit instruction of the men ; and with respect to those who are likely to become competent as Engineer clerks, or surveyors, or draughtsmen, that the schools be similarly regarded.
 - 3rd. That properly competent officers be appointed to the large detachments of recruits under instruction, and that the adjutants be relieved from the duties of company officers. At the present time the senior adjutant is the only company officer to a detachment comprising on an average 400 men.
 - 4th. That the officers thus selected for the duties of the detachment be chosen with a view to their being the instructors of the young officers in the subjects of attack, demolition, and military bridges.
 - 5th. That an assistant be appointed to the officers in charge of the survey courses, who shall be selected with a view to the instruction of the officers in topographical drawing, and in designing works of defence for sites described by contours.
 - 6th. That an officer be appointed to instruct in the general principles of construction, and to take the officers through a course in which they shall prepare original designs, with specifications, estimates, and working drawings.
 - 7th. That a course of lectures by the best informed gentlemen that can be procured be delivered annually on machinery ; the theoretical principles so far as they can be, and their practical application in designing machinery for various purposes and for the several descriptions of motive power, properly explained.

Such are the changes which I propose for this Establishment. It is unnecessary to detail them further unless the views with which they are proposed are approved. If approved, I am prepared, as before stated, to report as to any further details that may be required.

The following summary will give some idea of the average strength of the establishment in men and senior officers, if the above proposition be carried into effect.

Assuming the strength of the Corps at 4,000, and the

annual enlistment required for its maintenance at $\frac{1}{4}$ th, the number of recruits per annum will be 450.

Assuming eighteen months as the time necessary for ordinary drill and for training as sappers, miners, and pontoneers, the number of recruits under instruction here should be 660.

Assuming that each of the thirty-two service (deducting survey) companies ought to pass through the Chatham courses and be there one year during each period of home service, and that the proportion of time at home to time abroad is as four to six; then from three to four of the companies at home ought generally to be at Chatham.

Thus the strength ought to be :—

Companies	300
Recruits	660
Seniors permanently employed at headquarters, band, etc.	177
	<hr/>
	1,137

One-half of the Companies and two-thirds of the Recruits should be under continuous instruction, being

$$150 + 440 = 590$$

Add band and permanently employed	177
	<hr/>
	767

For other duties	370
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Allowing for sick, prisoners, absent with or without leave, etc., of these men	50
	<hr/>

To supply 50 duty men daily	320
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The number of officers would be :—

	No. Field Officers	Captains	Subalterns
Director	1	—	—
Second Officer	1	—	—
Adjutants	—	2	—
Two Survey, two Field Works, one Construction, and one Schools	—	4	2
Detachment Officers	—	2	2
Company Officers	—	4	8
	<hr/>	<hr/>	<hr/>
	2	12	12

I am, Sir,

Your obedient servant,

H. D. HARNESS.

War Office,
31st December, 1860.

From Sir John Burgoyne, I.G.F., to Colonel Harness.

MY DEAR COLONEL,

I have read over attentively your report on the condition of your Institution at Chatham, and what you consider that it requires to put it in the order necessary to meet its requirements.

Your statements are clear and, to my mind, conclusive; your demands are by no means exorbitant; and I hope they will be immediately assented to and authorised.

There are, however, one or two points on which I am not quite sure whether you go quite so far as I do.

1. After stating the acquirements which you would desire to give to the *men*, you add that "*with men so trained, it is obvious that scarcely more than one company could rarely be required at one point*"; the doubt then arises in my mind, whether it is intended by this, that the Sappers should be considered exclusively a *superintending* and not a *working* Corps. I myself attach *great* importance to the latter. In sieges, they cannot be in too great numbers, to *work*:—nor during the ordinary operations of a campaign, for field works, roads, bridges, hutting, surveying, etc., etc.

In colonies they are inestimable; during quiet times they *work*, usually at a much cheaper rate than can be obtained on the spot (in some cases workmen are not to be had at all); and then in times of emergency they take their arms, and add to the effective *military* power.

2. You advert very justly to the great loss of time (that should be otherwise employed) by subjecting the young officers and the men to a harrassing amount of ordinary military duties of the garrison, such as guards, etc., etc.

Such services are no doubt in excess, and many of them out of place, considering the peculiar objects for which officers and men are at the Institution; but I wish there was a disclaimer of any intention to depreciate the military organisation and exercises: for I have always considered it of very first importance, that our Corps, officers and men, should be recognised in the Army as excellent *soldiers*, and not lowered (as is desired by many) into the rank of civilians. Everywhere, therefore, a reasonable portion of time should be given to the military

exercises and attributes, and officers and men well trained in them.

3. In the multiplicity of matters of instruction at your establishment (almost too much in fact for a year or year and a-half) I have some impression that too much time should not be given to what is called the architectural course; for the practical purposes we require, it is scarcely susceptible of being learned by book and theory; the proportions of details of buildings and constructions, and to define proportion and put together the several materials are the essential items, and will be more readily acquired by closely witnessing the actual practice and operations, and studying by experience and effects how to gain strength with the smallest means, and therefore chiefly to be learned when employed on great works.

4. You propose lectures on machinery; but why confine them to machinery, and not rather to any indefinite number of any other useful practical subjects of information, and why should not officers of the Corps be encouraged to give them as well as civil lecturers?

Lectures act as a most useful and insinuating mode of diffusing information; and no one gains more knowledge from them than those who prepare themselves to give a lecture.

My dear Colonel,
Yours faithfully,
J. F. BURGOYNE.

The following letter, bearing an earlier date, written by a very distinguished officer, is of interest.

From Sir J. W. Gordon (then C.R.E.).*
Portsmouth,
30th October, 1860.

MY DEAR HARNESS,

I consider the following to be the points most prominently to be brought under notice:—

1. That, whereas in all other branches of the service provision has been made for the advancement of officers and men in knowledge, there has been, ever since the Crimean War, such a constant drain on the Corps of Engineers, that both officers and men are always removed from Chatham, not only before they have gone through a course of instruction intended to keep pace with the improvements introduced into

* Colonel Sir J. W. Gordon, K.C.B., who gained great distinction at the Siege of Sebastopol.

other branches of the service, but, before they have even had time to complete the course laid down in former years.

2. That, more time must be allowed to both officers and men to receive a thorough knowledge of their duties before they are removed from this establishment. The course of study embraces a great variety of subjects, and generally, speaking, both officers and men leave the Establishment with but a superficial knowledge of even the most important of their duties.

To submit the following improvements, or any others, would be wholly useless unless the officers and men can remain a longer time to devote to their cultivation.

By fixing the establishment in the following manner it appears to me that this object might be attained.

Having ascertained the number of officers and men required for all stations at home and abroad, then let there be added to those numbers the number of casualties during two years for officers and during one and a-half years for men, and thus there would be an establishment fixed of a strength to enable the young officers and recruits to go through a full course of instruction.

It will not, however, be sufficient to give these young officers and the recruits a good course of instruction on their entering on their duties ; provision must further be made for a portion of all ranks returning at intervals to Chatham to renew and to extend their knowledge. If, say, one-tenth was added to the total obtained above, there would then be a surplus whose time could thus be employed, and nearly all the officers by such a plan would have the incalculable advantage of being about six months at Chatham on their return from every five years' tour of foreign service.

An increase to the Corps will, I doubt not, be required before this most necessary measure can be carried out.

What if, in enumerating the additions of instruction successively added to Chatham, you were to shorten the wording of that of the Survey, and if having summed up these you were to say "the whole course of instruction in military matters has been added to the Field establishment, having been transferred from Woolwich to Chatham ;" you could then say that nominally a very wide field is already established, but in reality by no means gone over thoroughly.

I like all your suggestions, and I have only to ask if you are correct in the following :—

1. The companies are officered now at Chatham just in the same manner as they were officered at Chatham when I was there. There were only three companies, I think, and there were three second captains, *all* the subalterns being young officers. Your paragraph does not seem to me to correspond with that statement.
2. If from your total for Chatham you deduct all the men you call recruits, you will not have enough left to carry on battalion drill, and this is essential to giving (especially the officers) a practical knowledge of the movement of troops. You ought not to have less than six companies at Chatham, and eight would be better.
3. You have only allowed four officers to the detachment. A four company depôt complete in all respects is my notion of what is wanted.

The country will expect that military Engineer officers and soldiers are at all events fully instructed in their field duties—but from the returns it will be seen that the young officers on an average are only able to devote ten days each to acquiring a practical knowledge in all the details of the numerous duties connected with sapping and mining, the construction of batteries, pontooning, etc.; and therefore it is needless to add they leave the Establishment incapable of doing so, and moreover it is only a very few of them who ever, during their whole period of after service, come here to have any further instruction, and nowhere else is instruction to be had.

And “the Engineer soldiers serve on an average only so many days’ instruction, etc.” . . . But “Engineer soldiers should be, etc., etc.,” as you have so well described.

Again, as, to the Engineers is devolved the construction and maintenance of all barrack buildings, all ranks of the Corps should be able to perform the duties required of them. But from the returns it will be seen that the whole of the instruction received by the young officers in construction of buildings, in taking measurements, drawing up specifications, etc., is given to them in an average of twenty days. Practically it amounts to next to nothing, and Engineer officers are sent to stations without any knowledge of practical building and of office duties. These they pick up as they best can. In them they are self-taught.

Great alterations are being introduced in the construction of barracks to promote the health and welfare of the British Army, and surely the Engineers should be taught a knowledge of construction and of sanitary improvements before they are called on to take charge of such works.

The soldiers of the Engineers receive less instruction in these matters even than the officers, and most praiseworthy is it in those who have in odd times, and at foreign stations, made themselves competent to perform the duties of foremen of works, of which there are many instances.

I would state that Major-General Eyre* has given his unceasing attention to the improvement of the Engineers of all ranks as soldiers, and that they never were in such a state of advancement in drill and military matters since removed from Woolwich to Chatham, nor the officers so well acquainted with their military duties as at present.

But when I have admitted that the Corps is better instructed in military matters than it was formerly, I would add that in every branch of the special training of Engineers, the officers and men were more thoroughly instructed thirty years ago than they are now.

I would slip in a sentence to say that your predecessors† had drawn up an outline of an extension of the course of study, but never during Sandham's time had he been able to enter on it; and latterly, when officers and men were so largely called for, even the old course had to be abridged, and abridged it is still.

Would you not make a pointed sentence about *examinations*? They are essential to ascertaining the amount of knowledge possessed. They must be proposed by you for officers quitting your establishment. . . . Something about civil engineering, as far as applied to military matters, being introduced, as essential knowledge to a military officer to make the most of the material he finds in an enemy's country. This is not being taught at all. *Lovell's* "batches" I do not consider necessary. Companies are better, I think, and squads can be made up always of the same men from the companies.

A telling sentence might be introduced of the evil effects of an establishment kept at the lowest possible numbers,

* The General Officer commanding the Chatham Military District.

† Colonel Sandham, R.E., and Colonel Lovell, R.E.

as shown in the return, say, of the 27th Company, the one which every exertion has been made to keep in a state of efficiency for the first foreign service; and yet with my desire not to take any transfers from this company especially, there has actually in two years been a number of transfers from it equal to double the strength of the company: and not one single recruit with education completed at Chatham.

My time is up. Pardon me for having scrawled rapidly, and for not having said more in praise of all you bring forward, *draining ground* especially.

Yours,

J. W. GORDON.

The reforms in the courses of instruction at the School of Military Engineering were at once commenced. Additional officers were appointed as assistant instructors to the schools of surveying, field works, and electricity, and a superintending officer was appointed over the school of construction.

Examination of Lieutenants.

The following letter to the Deputy-Adjutant-General of Royal Engineers, on the question of the *examination of Lieutenants* of Royal Engineers in their professional duties *previous to their promotion*, is valuable in connection with the reforms at Chatham then under consideration and the now established rule, namely, that all officers of the Corps shall pass the same examinations previous to all promotions up to Field Officer's rank, as is enjoined upon the officers of other branches of the Army.

Royal Engineer Establishment, Chatham,
29th November, 1860.

*To the Deputy Adjutant-General Royal Engineers.**
SIR,

I herewith return the memorandum from the Council of Military Education which was forwarded with your confidential letter of the 26th inst., and after carefully considering the suggestion contained in the last paragraph of that memorandum, am not disposed to agree therewith, nor to recommend any examination for

* Colonel Sir Frederick Chapman, K.C.B

the lieutenants of Royal Engineers as a preliminary to their promotion to the rank of second captain.

In the artillery, cavalry, and infantry, the subaltern officers are employed with the other officers of their troop or company in the established duties of the particular arm to which they belong, and their familiar acquaintance with those duties before they are charged with the care of a troop or a company is necessary, and cannot perhaps be satisfactorily ascertained except by such examination as that ordered to be adopted. The duties of the Engineer officers cannot be thus defined; they do not undergo the least change on promotion from lieutenant to captain. His ignorance of his profession as a subaltern is as likely to be injurious as his ignorance after that promotion. A full professional examination of an Engineer officer after fourteen or fifteen years' service (which must be regarded as the probable service of our subalterns; many have been longer) would cause much embarrassment; for what could be done with the officers, who, after being allowed to spend so many years of their lives in the service, did not pass that test. And the prospect of such an examination would greatly diminish the desire of the cadets at Woolwich to enter our Corps. Any examination less than a complete one would be mischievous, by tending to create an impression in our subaltern officers that the knowledge required for that examination was sufficient for their duties. Moreover, the character of the professional knowledge practically required by an officer during the early years of his service, and also its extent, must depend almost wholly on the nature of his employment and the scene of it, and will be found to be very various from that cause with different officers.

Nor is an examination necessary; the career of each Engineer officer is a continual examination to an extent sufficient to enable a judgment to be formed of his ability and qualifications. And neither the Inspector-General of Fortifications, nor the Deputy-Adjutant-General of the Corps, can have much difficulty in choosing men fitted for a duty for which an officer is required, or in allotting duties to them.

But it is very essential that none shall be admitted into the Corps who may not be confidently expected to make good Engineer officers. And I am of opinion that candidates for the Corps should, in the first instance, when joining at Chatham, be only gazetted with "temporary" rank, to be confirmed with the original date if they pass

certain examinations at Chatham within a given period. I presume that there could be no objection to young men who having passed through the Royal Military Academy, and conducted themselves well at Chatham, had failed in such examinations, being commissioned in some other Corps.

I am, etc.,
 (Signed) H. D. HARNESS,
 Colonel Royal Engineers,
 Director.

Employment of Soldiers at Trades.

In 1862, a War Office Committee was appointed to inquire into the question of *instructing and employing soldiers in trades*, in the Army generally. There was an idea, not unnatural, considering the spare time that often occurs to the British soldier, that it could be usefully employed in teaching him some trade that would be beneficial both during his service and after his discharge.

This question was referred to Colonel Harness, among others, for his opinion; which it will be seen was adverse to the idea of spending time and money in providing special workshops for the purpose. Some attempt was made to carry out the idea; it did not, however, succeed. Since that date the time of the British soldier has been more legitimately employed in learning all the branches of his profession.

War Office,
 30th January, 1862.

Colonel H. D. HARNESS, C.B.,
 Director of the Royal Engineer Establishment,
 etc., etc., etc., Chatham.

SIR,

As president of the Committee appointed to inquire into the question of instructing and employing soldiers in trades, I have the honour to enclose for your information a copy of the Committee's instructions.

The Committee would feel greatly obliged if you would favour them with any observation or suggestion upon the subject generally, and also with your opinion whether the

establishment at Chatham could in any way be made conducive to the objects in view.

I have, etc.,

(Signed) I. R. CRAWFORD,
Major-General.

Instructions for the Committee appointed for the Instruction and Employment of Soldiers in Trades.

You are to consider and report upon the following matters :—

- 1st. The proper means for the instruction and employment in trades or callings of soldiers having a competent knowledge therein; of soldiers imperfectly acquainted with or ignorant of any trade or calling, but who may desire instruction therein; of the sons of soldiers; of the daughters of soldiers.
- 2nd. Whether the system should be garrison or regimental.
- 3rd. At what place or places at home or abroad the system should be tried in the first instance.
- 4th. What buildings it would be necessary to provide, at what cost, and how to be defrayed.
- 5th. What tools should be provided, and how paid for.
- 6th. How materials should be purchased, accounted for and paid for.
- 7th. The rate of remuneration for work done, the rate of remuneration for instruction given, and manner and means of payment.
- 8th. The nature of the trades or calling to be practised or taught.
- 9th. The advantages or indulgences to be given to soldiers practising or learning trades.
- 10th. The disposal of profits.
- 11th. The keeping and auditing of accounts.
- 12th. The extent to which troops could with advantage be employed on barrack damages, barrack repairs, or other public works.
- 13th. The regulations under which soldiers or their children should work at or be instructed in trades.
- 14th. The reports to be made to enable the success of the system to be tested.

(Signed) G. C. LEWIS.*

10th December, 1861.

* Sir George Cornwall Lewis, Secretary of State for War.

Royal Engineer Establishment, Chatham,
4th February, 1862.

From Colonel Harness.

SIR,

The subject referred to in your letter of the 30th ult. is so comprehensive that I feel much diffidence in expressing an opinion upon it. I have endeavoured, however, to form one to the best of my ability.

The first part of the first instruction to the Committee relates to soldiers who are already artificers. It is impossible to assume that work would be undertaken merely to provide employment for them—to do so would be to diminish the funds available for necessary military works. The only other mode is to employ them as far as possible, consistently with true economy, in the execution of the works which have been showed to be necessary and been sanctioned by Parliament. It is clear that for this purpose they must be placed at the disposal of those who are responsible for the execution of those works.

With regard to the second part of the first instruction to the Committee, I am of opinion that to teach soldiers trades would be an expensive mode of increasing the number of artificers in the Army. That it would be better, to increase the inducement for artificers to enter by increasing the advantages of pay and pension up to the point found necessary to obtain the proportion required, than to spend money in making shops, supplying tools, materials, and teachers, for the instruction of men in the ordinary trades of the country. With respect to the sons of soldiers, it might be advantageous to the public, wherever there are Government workshops, to take into them as many as could properly be taught without impeding the work of the shops, on the understanding that they were to enlist, or on their being already enlisted as supernumerary boys. Beyond that point it could only be regarded as a charitable act, and I think it probable that when they were to be taught with that view, it would be a more prudent arrangement to pay an apprentice fee to a civilian master than to establish schools for instruction. For the girls, it is difficult to suggest any valuable handicraft: knitting is nearly obsolete in that sense, and needlework appears likely to be rendered so by the use of sewing machines. Reading, writing, and arithmetic, carried as far and to as much perfection as the time available for their instruction will permit, and a good

use of the needle, appears to be all that could be wisely attempted to give them the fullest advantage of the short time they are likely to have for acquiring any learning.

With the above views it is unnecessary for me to allude to the remaining items of the instructions for the Committee.

But your letter inquires "whether the establishment at Chatham could in any way be made conducive to the objects in view." At present the artificers' workshops of the establishment are on a very small scale, the work in them being limited entirely to the preparation and repairs of the articles required for the course of field instruction. But it is very desirable that larger workshops should be maintained here: the instruction of the young officers in practical *architecture** renders the existence of workshops on a sufficient scale, and containing a variety of work desirable for their improvement. And I intend, when the proper time arrives, to suggest their addition to this establishment, and hope to be able to propose an arrangement by which such shops can be fully employed without any additional expense to the country. They would, however, afford little, if any, opportunity for the employment of soldiers of the Line unless a much larger quantity of work can be advantageously sent to them than I have any reason to expect.

These shops would also afford means for testing the skill of the recruits sent to the Corps, and for training some of our own buglers and supernumerary boys, who if well taught would probably become valuable men to us.

To make an army competent to supply every demand when self dependent, and to maintain the organisation required for that purpose in working order by continual use during peace, are very essential to success. But so far as the building trades are concerned, these ends will not be attained by such desultory employment as appears to be contemplated in the instructions to the Committee. To make military labour effective, it must, I think, be concentrated under one department and one code of regulations, and the individuals must be continually employed or these works will be exceedingly expensive. Those who have not had the charge of works can form no conception of the great difference between the labour

* It is suggested that the expression "building construction" is more appropriate.—[Ed.]

of a working party which is changed once a month and one which is never changed, and with artificers the retention of the same man without break to the same job is yet more important.

(Signed) H. D. HARNESS,
Director Royal Engineer Establishment.

Army Telegraphs.

In 1863 Captain Schaw,* who was then in charge of the Telegraphic School at Chatham, proposed the formation of a Telegraphic Branch of the Corps.

In the following memorandum the subject is considered, in accordance with Colonel Harness's usual manner, in connection with the larger question of the proper organisation of the Engineer force required in the British Army.

Royal Engineer Establishment, Chatham,
11th May, 1863.

*Minute in reply to that of the Inspector-General of Engineers
of 9th May, 1863.*

In forwarding to the Deputy Adjutant-General on the 8th April last a letter from Captain Schaw, Royal Engineers, who is in charge of the Telegraphic School of this Establishment, suggesting the organisation of a Telegraphic Corps, I showed that while considering it most important that definite arrangements should be adopted to ensure an efficient body of military telegraphists being immediately available when called for, my views were not quite in accordance with the suggestions made by Captain Schaw for the formation of a separate Corps of Telegraphists, and there is nothing in the paper by Captain Bolton† (herewith returned) to alter my views of the subject.

* Colonel Schaw, R.E., who died in New Zealand, 1902.

† Afterwards Sir Francis Bolton, of Army signalling reputation.

The whole question of the organisation of the Engineer force of an army is but the continuous consideration with respect to the various description of services to be provided for, of the extent to which it is desirable to carry the division of labour. The conclusion on this point ought probably to be different for each of the European armies, and we are more likely to arrive at a wise decision by considering our own requirements, and our own people which we know, than by seeing what other nations do, without knowing completely all the reasons that influence their arrangements.

Our present system is to instruct many of our Engineer soldiers in the mechanical execution of some art for which they are suited, in addition to the handicraft they had learnt before enlistment ; and to obtain thus many men well fitted on sudden emergencies to increase the number of men usually required of any particular description.

Thus the non-commissioned officer who was sent some months ago to Aldershot to take charge of the electric telegraphy, had been useful in India as a clerk, as a draughtsman, as a photographer, as well as by his knowledge of the electric telegraph. While also we have men thus instructed as the mechanical operators, we have numerous officers acquainted with the philosophical principles of the various useful arts and available for their application, without being abstracted from their duty as Engineer officers. Lieutenant ———, who is referred to by Captain Bolton as an officer well fitted for a Telegraphic Corps, is one of the young officers under instruction at this Establishment, who has just completed with credit to himself the course of telegraphy now taught here ; and is available for any of the duties required from an Engineer, including the erection of a line of telegraph. To turn him into an officer of a Telegraphic Corps, would be to deprive the public of his services as an Engineer generally, and would undoubtedly make him in a few years less valuable even for the service for which he had been exclusively appropriated, by the comparative idleness

and want of responsibility to which he would have been consigned.

But it is desirable that a sufficient number of trained telegraphists should be kept in England and so employed as to keep up their skill, without producing embarrassment by their numbers ; and I see no difficulty in effecting this arrangement without any expense whatever to the country.

Two or three times the number required to work the military telegraphs which it is desirable to establish in connection with the extended works at Portsmouth, Plymouth, and Chatham, and the telegraph at Aldershot, should be attached to the companies of Engineers at those stations respectively, taking the telegraph duty in turn with other occupations as may suit the convenience of the works carrying on there.

All above the number actually required for telegraph duty at each station would be available for any telegraph detachment which might be required, and could be transferred within a few hours to the charge of the officer of their own Corps selected for the duty ; and the officer so selected would be very much better fitted for the charge if, up to the date of his selection, he had been occupied in contending with professional difficulties, even of a very opposite nature to those with which he would then have to deal, than if occupied only with the pay, discipline, and distribution, of about fifty men of a Corps with a special duty.

It would be prudent also to retain about ten competent telegraphists of those instructed in all description of telegraphy constantly at Chatham, and to allow Captain Schaw, the Superintendent of Schools, an assistant, to be relieved every six months, which would ensure an amount of telegraphic knowledge among our officers ; and a complete field equipment might be retained here in charge of Captain Schaw in readiness for use, with the packages necessary for its transport by sea, in addition to the means of instruction

which have been, or may from time to time be, supplied to this establishment.*

(Signed) H. D. HARNESS,
Colonel Royal Engineers,
Director.

In December, 1863, a draft for a new warrant for the Chatham establishment was submitted by the Deputy-Adjutant-General for the Royal Engineers to the Inspector-General of Engineers, and to the director of the Establishment at Chatham, for their opinions. Colonel Harness's memorandum on it is here given; it is a short treatise on the principles by which the education of this branch of the army should be regulated; and as such is a valuable guide for the future, whatever the changes in warfare.

Royal Engineer Establishment,
Chatham,

December 27th, 1863.

MEMORANDUM by Colonel Harness with reference to draft of proposed new Warrant for this Establishment forwarded to him with the Minutes of D.A.G. of R.E. of the 17th December, 1863.

It is desirable that a new warrant should from time to time be issued for an establishment which requires both change and development as engineering skill and knowledge progress; and the alteration made in the administration of the Ordnance branch of the Army since the last warrant render a new warrant now almost necessary.

The use of a warrant is to provide permanently for the objects of the institution to which it is granted—by giving authority to those who are to guide it, and securing all necessary appliances and funds for its exclusive use. To

* In 1870, the 22nd and 34th companies Royal Engineers were placed at the disposal of the Post Office, to secure the means of special training in telegraph engineering and working under the practical conditions alone existing in the State telegraphs. They were commanded by me (then Major Webber), who had studied the subject in Germany, and who had reported in detail on the Field Telegraph Sections of the Prussian Army in the War of 1866.—[ED.]

prepare a warrant then it is necessary to see clearly all the objects that are to be provided for, and what authority should be given to ensure their attainment and the due appropriation of the funds and other means allotted to it.

The objects of a training establishment for military Engineers must, for this country and this age, be numerous and varied. The warrant for a school of musketry with its single object affords no guidance. Nor even the warrant for the school of artillery—the latter school being far more limited in one sense, but having a peculiar extension in another, viz., as experimentalists for the Ordnance Select Committee.

The first warrant for the R.E. Establishment, issued in 1812, provided for nothing more than the instruction of officers and men in field operations. But between that period and July, 1850, the date of the existing warrant, the objects of the establishment were considerably extended. The topographical course, which had been the subject of a separate instructional arrangement for candidates for the Royal Engineers between leaving the Royal Military Academy and joining at Chatham was, in 1833, added to its courses. Instruction in practical architecture had been added about 1825, and the warrant of 1850 provides for these subjects.

We now know that in any future war all the engineering knowledge and skill which can be applied in military operations must be available in an English army; and the progress in these subjects has been so great and is so rapid, that careful and deliberate judgment is required in arranging the means to attain this result. At present two subjects, telegraphy and photography, are added to the courses of instruction; and it has been declared to be desirable to train non-commissioned officers for overseers of works by special instruction, and to establish workshops on an extended scale in connection with the establishment.

But the draft for the proposed new warrant only declares the object of the establishment to be instruction in "military engineering," which might receive very different interpreta-

tions within brief periods, as changes in the individuals presiding or advising at the War Office and Horse Guards occurred. A warrant so expressed would not ensure permanency in the objects of the establishment.

To my mind the subject presents itself thus :—

To form an army is to organise and train a body of men in such manner that they shall be ready at any moment to maintain themselves, in even an isolated position, as an orderly and disciplined community, able to move promptly and to attack, or to defend themselves against their enemies as they may be required. As with civil communities, some sub-divisions of duties are requisite for this purpose—these sub-divisions become more numerous as the advance of civilisation increases both powers and wants. Such a military community requires in these days a construction branch as much as a civil community. There is no description of engineering works which may not become essential to the success of a military operation, and *some* work is constantly required. A construction branch must, therefore, form one of the sub-divisions of every army ; its officers must know the principles (at least) of all descriptions of engineering works, and be practised in construction ; for we cannot make a man an engineer by giving him a commission and calling him one. Besides this special professional instruction the individuals of this branch must be fitted to be members of an army ; that is, must be made soldiers by being trained to habits of self-control, and of prompt and precise obedience to the legitimate orders of their recognised superiors ; to admiration and respect for truth, justice, and chivalrous conduct ; and to contempt for the opposites to these—these being the characteristics that cause soldiers to be easy to move and govern by those who also possess them, and which produce in each soldier confidence in his superiors and his comrades under all emergencies.

The R.E. Establishment has to train the officers and men of the Corps in professional knowledge, but they must also

acquire at it the characteristics of soldiers, or they will not be likely to acquire them afterwards. The warrant should be in such terms as may be necessary to declare this, but it only provides for the former. It should state and define clearly the dependance of the establishment on the Inspector-General of Engineers, who under the Commander-in-Chief is the Head of the Corps, and responsible for all the duties carried on by it. It should provide for the preparation of the annual estimates for the establishment and for its expenditure. The premises to be occupied ought, under the circumstances of the establishment being placed in a large garrison, to be assigned by the warrant ; and the sole control of the Directors within those premises established by it.

There is no reason for providing in such a warrant for any part of the staff of the Corps, which is similar to that of other branches of the army ; nor for ordinary regimental duties and discipline, nor for defining duties of officers under the command of the Director. Such unnecessary additions would be objectionable, as the inferences that might hereafter be drawn from their being thus specially provided for cannot be foreseen ; and any uncertainty of that kind can only be mischievous.

Besides these observations on the principle of the proposed warrant, there are objections to the details, but it is useless to consider the details until the principle is clearly worked out.

H. D. HARNESSE,

R.E. Establishment,
Chatham,

Colonel Royal Engineers,
Director.

27th December, 1863.

Demand for Officers of Royal Engineers from the Government of India.

In August, 1864, the Indian Government drew attention to the importance of maintaining the Indian establishment of Engineer officers at their proper strength, and asked for twenty-one additional subalterns for that purpose : it will be

seen that Colonel Harness's reply expressed a strong opinion as to the evil of taking young officers away from Chatham before they had completed their full course of instruction.

Horse Guards,
6th September, 1864.

TO SIR JOHN BURGOYNE,
Inspector-General of Fortifications.

In continuation of my minute dated 7th July last, respecting the number of officers under instruction at Chatham, I submit for your consideration a copy of a letter received from the India Office (31st August, 1864) on the importance of maintaining the Indian establishments at their proper complements of officers, for which twenty-one subalterns are now required.

As these cannot be furnished from our own stations without seriously interfering with the progress of the home defences, I think some effort must be made to procure them from Chatham, where there were seventy-five young officers on the establishment at the commencement of this month.

(Signed) FRED. E. CHAPMAN,
D.A.G., R.E.

Sherborne,
15th September, 1864.

From Colonel Harness to the Deputy-Adjutant-General, R.E.

The papers relating to the immediate transfer to India of young officers who have not completed their course of instruction at the Establishment were referred to me from Chatham.

In returning them I enclose a list showing the time required by several of the more advanced officers to complete their respective courses.

All the facts required for the consideration of the subject referred to in these papers, in the full manner in which it should be considered by the Director of the Establishment at Chatham, are not known to me. I collect from the India Office letter that the Indian Government wish seven battalions of officers to be in India, and the proportion required to be under

instruction to be additional to these ; and from the minute of the Deputy-Adjutant-General of Royal Engineers, that twenty-one subalterns are required to complete them.

The last batch of officers intended for India exclusively, joined at Chatham on the 1st August, 1860. During the two years preceding that date, the number of officers under instruction for India averaged, as deducted from the monthly returns, twenty-three.

Since the 8th April, 1862, the date of departure of the last officer intended for service in India, only forty-seven officers have left the Chatham Establishment, of whom sixteen are understood to have been sent to India.

At the time of the amalgamation the Indian Engineer establishment was somewhat increased, and lately the architectural course at Chatham has been gradually extended ; these causes render an increase in the average number at Chatham, on account of the demand for India, necessary.

For the present strength of the amalgamated Corps and for the present course, seventy-five officers under instruction will probably prove the normal condition of the establishment, of whom thirty-six may be considered as required to maintain the portion of the Corps in India ; and out of every twenty-five officers leaving Chatham, twelve should go at once to India. Under the conditions, therefore, of the amalgamation, it may be expected to be necessary to send about eighteen or twenty officers annually direct from Chatham to India ; and after the first seven years of the amalgamation, when relief becomes necessary, to send in addition to the above number from Chatham an equal number as reliefs of ranks corresponding to those to be relieved. This is irrespective of any demand that may be made necessary by the employment in England of officers on the Indian establishment.

If the amalgamation is to be maintained, it should, I think, be by an arrangement of this kind, clearly established and carefully observed.

It would be difficult to express too strong an opinion

against an endeavour to meet sudden urgent demands for Engineer officers, whether for India or other places, by taking them from Chatham without completing their courses of instruction.

In the Line an officer may, without the slightest impropriety, be sent on service directly he is commissioned. He cannot learn his profession better anywhere than with his regiment. But could the medical staff be thus recruited? Yet their profession is not more dependent on study, nor less on practice, than our own.

Assistant-Engineers can always be obtained, either from the army or civil life, quite as useful as imperfectly instructed officers of the Corps. And by resorting to their use when pressed, we avoid the evil of introducing imperfectly instructed officers into it, which has occurred in some instances by allowing officers to leave Chatham too soon in times of pressure.

(Signed) H. D. HARNESS,
Colonel Royal Engineers,
Director R. E. Establishment.

Colonel Harness, subsequently, in January, 1865, proposed the appointment of a Committee to consider the subject of the duties of the Corps of Royal Engineers, under the new conditions of warfare consequent on the improvement in weapons and in mechanical appliances, and also the important question of the education of the officers and men of the Corps. The following short memorandum, addressed to Sir John Burgoyne, I.G.F., gives his general view of this matter.

Proposal by Colonel Harness for a Committee to consider the changes necessary in the Royal Engineer Establishment, 1865.

4th January, 1865.

SIR J. BURGOYNE.

The subject of the instruction to be given at the Royal Engineer Establishment is of so much importance that I see

no reason for a change in the general opinion expressed in your minute of the 21st November, 1864.

The requirements for the due instruction of Engineer officers at their school of application have not been considered by a special Committee since 1812. After the report of that Committee, the first Royal warrant for this Establishment was obtained.

No branches of science can have made greater progress since that period than those on which the profession of the military engineer is now dependent. The knowledge and skill of the best instructed engineers must be available in war as now carried on.

How the Engineer department should be organised to meet the extraordinary development in the nature and extent of the demands likely to be made upon it in war, and how the education of its officers here, and the means for giving them practical experience at stations, may be best arranged to fit them to take their places in that organisation, are extremely difficult questions. They require to be considered especially for this country; the professional demands on English officers of Engineers, both in peace and war, being more varied than those which the military engineers of other countries are likely to be required to meet. But this difference, while it renders special consideration and more extended instruction necessary, affords also the means during peace for making our officers better engineers than those of nations with a less varied field of employment.

If the views of the Director of the Royal Engineer establishment on the questions affecting its successful management, and on the subjects above mentioned, were sure to be in accordance with the views of the most influential officers of Royal Engineers, no inquiry on the subject would probably be necessary. But at the present time a wide difference of opinion on these subjects appears to exist; and I believe the only mode to render this professional school

efficient is to obtain a report on its requirements by a competent Committee.

My note to you of the 29th October, 1864, was written under the impression that the new warrant for this Establishment could not be settled without such investigation ; and I presume that in any Committee of Engineers for that purpose, the Secretary of State for India should be represented, and a finance officer from the War Office be included. To the Committee appointed to discuss the terms of the warrant, all questions required to be settled with reference to this establishment might be referred, including its subjects of instruction. This course I strongly recommend to the Inspector-General of Fortifications, and hope that it will be submitted, with his approval, to the Secretary of State for War, before whom the papers relating to the new warrant are at present understood to be.

H. D. H.

The Committee on the Royal Engineer Establishment and Schools at Chatham.

In March, 1865, the Secretary of State for War communicated to the Commander-in-Chief his desire that a Committee should be formed to inquire into this matter ; and it will be seen by his letter given below that the subjects of inquiry were extensive, including " the course of instruction to fit both officers and men for their duties in the field," and " in the duties required of them in the designing and superintendence of military works and buildings, as well as that of non-commissioned officers as superintending foremen." His Royal Highness the Commander-in-Chief at once concurred in the proposal, and recommended that the officers whose names are given in the abstract of the report should be appointed as members. It must be borne in mind that the reform of the Establishment had been going on ever since Colonel Harness took over the command in 1860, and as a result the Committee which made its report in September

of 1865 did not find that any important alterations were required ; but recommended that the existing system should be confirmed and that proper provision should be made for all the accessories required for the several courses, and also that a sufficient time to ensure efficiency should be given to each course.

War Office,
11th March, 1865.

From the Military Secretary, Horse Guards.

SIR,

With reference to your letter of the 7th April, 1864, 38073/1, and to subsequent correspondence relative to the proposed issue of a new warrant to define the position, pay, and allowances of the staff attached to the Royal Engineer Establishment at Chatham.

I have the honour to acquaint you, for the information of H.R.H. the Field-Marshal Commander-in-Chief, that Earl de Grey and Ripon having had under consideration the question of the organisation of this Establishment, is of opinion that it is very desirable that a Committee should be formed to inquire into the subject.

The points requiring investigation appear to His Lordship to be as follows :—

1. The course of instruction to fit both officers and men for their duties in the field.
2. The education of officers in the duties required of them in the designing and superintendence of military works and buildings, and that of non-commissioned officers as superintending foremen.
3. The several branches of science to be studied, and the extent of proficiency required in each.
4. The length of time that officers and men should remain under instruction at the institution.
5. Any other details connected with the arrangements of the Establishment into which it may be considered desirable that the Committee should inquire.

Should this proposal meet with the approbation of the Field-Marshal Commander-in-Chief, Lord de Grey would be glad to learn the names of the officers whom His Royal Highness would propose to select for the investigation of this important subject.

I have, etc.,

(Signed) E. LUGARD.*

* Sir Edward Lugard, K.C.B., Military Secretary.

*Abstract of the principal Recommendations of the Committee,
September 22nd, 1865.*

They point out that the first warrant for the formation of the establishment was in 1812, and that no other warrant had been issued until 1850.

With respect to the duties of the Royal Engineer Corps, they call it The Constructional Department of the Army—they point out the important consideration that the Engineers may be required, in the performance of their ordinary duties in the field, with an army, to apply the principles of all the various courses taught in the School: and that for their duties both in peace and war, namely, the construction of fortresses and barracks, the formation of roads and bridges, wharves and storehouses, cantonments and hospitals, and the use of electricity in telegraphing and mining—these entail a knowledge by the Corps of the theory and practice of those sciences.

They considered that the existing courses of instruction, as reformed under Colonel Harness, required but trifling modifications.

As regards the purely "Army" training and instruction, the transfer of the headquarters of the sappers from Woolwich to Chatham, which took place about 1860, provided fully for it.

For the Field Works Course, they considered it desirable that a regular course of field-work instruction should be laid down, not only for the Chatham School, but for the use of all stations where companies of sappers were quartered; and, they point out the necessity of careful instruction in field works for officers and men, as they have to be the guides of the rest of the army in those matters, and, as they perceived that the regimental duties interfered with the training at Chatham, they recommended that all officers and men should be relieved from all other duties during instruction, and that one day a week should be given for those duties.

And they also recommended that a pecuniary reward, with badges, should be given to the most proficient men in field works.

Including the time spent in schools, in which reading, writing, arithmetic, and mechanical drawing, and fortification are taught to the men, they considered that 270 days should be allowed for the field works course for the men, and four months for the officers.

And they point out the necessity for ensuring that each company previous to going on foreign service should go through a short course of field works at Chatham.

Survey Course.—This course is intended chiefly for officers, to give them some practical knowledge of the principles of making a correct map of a country, and also of rough reconnaissances of small areas, and of taking astronomical observations. The Committee appear to have considered this course to be provided for in a satisfactory manner, as the only recommendation they made, related to the travelling expenses of the young officers when on reconnaissance duty.

The full time required for the course, including all parts of it, they considered should be six months.

There is also a practical course for the men in surveying, which occupies them seven months; but this time includes military duties.

Architectural Course.—During the time Colonel Harness had been Director of the establishment considerable changes had been made in this course; which up to that time had been simply instruction in the art of building barracks, and of making the necessary plans, specifications, and estimates, as established by Colonel C. Pasley. This instruction was given by a Clerk of Works of the Royal Engineer Department, selected for the purpose, and it will be seen by Colonel Harness's evidence to the "Committee on Barrack Works," of 1862, that he had himself found it of practical value to him as a young officer.

The Committee expressed the opinion that these changes

in the course had formed a good foundation on which the young officers could satisfactorily commence the practice of their ordinary duties in this branch of their service. These changes consisted, in some practical instruction in the application of the principles of mechanics to constructions in general; in gaining some information about the various materials used in constructions; and also a knowledge of the general requirements in the military service for buildings and works of all kinds. Towards these objects lectures on several special parts of the whole subject were given by experts in those parts from the profession generally: and select parties of the officers were taken to see the engineering works and factories of the country.

They considered that the time for this course, which was then about 140 working days (*i.e.*, exclusive of military duties) might be reduced to 120 working days: but they had the justice to add that the Superintendent of the course strongly objected to any reduction of the time, he, knowing from his own experience, the extreme value to the officers of a careful study and noting of the particulars of this course towards a good fulfilment of their duties in this branch.

They, however, recommended that a more extended course should be provided for older officers wishing to study the subject later on in their service.

For the non-commissioned officers and men there was also provided a short course of construction, in architectural drawing, and measurement of work, and estimating; but only a few selected individuals were put through it. The course occupied ninety days. The Committee recommended that this course should be reserved for non-commissioned officers who were likely to prove good Foremen or Clerks of works, and that for them it should be further extended.

The other courses then carried on in the establishment were for *Telegraphy, Electricity, Chemistry, Photography, and Printing*; of these the greater part could be carried on at night, without interfering [with the purely mili-

tary instruction or duties ; and, in fact, only selected men were instructed in any of them. The Committee recommended that for all these special subjects non-commissioned officers and sappers should be specially selected from the whole Corps ; and they considered, under the above mentioned considerations, that ten working days for telegraphy, and electricity applied to mining, would be sufficient allowance.

The time required for the whole course at the Chatham School would therefore be, according to the recommendation of the Committee, twenty months. This would be divided into *Field Works* 4, *Survey* 6, *Construction* 6, *Telegraphy and Electric mining* $\frac{1}{2}$, and military instruction and duties $3\frac{1}{2}$ months.

General Recommendations of the Committee.

That, on finally leaving the School there should be an examination in all the courses of study, with a report on each officer by the Head of it.

That, in order to give the recruits an opportunity of putting in practice the lessons in construction they had received, workshops should be provided, in which the various constructions and articles required for the field works and some other courses should be made as far as practicable.

That, the head of the School should be immediately responsible to the Commander-in-Chief on all matters relating to instruction.

That, officers should be specially appointed to carry on the military duties of the headquarters of the Corps, by which the *total time of residence* of the officers under instruction would be reduced.

That, the Royal Engineer Committee, lately formed for consideration of appliances and constructions for the Engineer service, should be specially appointed for the purpose, and not be composed of officers on the instructional staff.

That, the pay of some of the instructional officers should be raised.

Officers signing the Report.

General SIR RICHARD AIREY, Quartermaster-General.

General SIR FREDERICK ABBOT, Indian Engineers.

General SANDHAM, Royal Engineers.

Colonel JOHN W. GORDON, Royal Engineers.

Colonel J. LINTORN SIMMONS, Royal Engineers.

Colonel ADDISON.

Colonel HAWKINS, Royal Engineers.

Colonel Harness's Retirement from the Directorship of the School at Chatham.

It seems desirable and proper, for the justification of Colonel Harness's character, that some account should be recorded of his retirement from the head of the Royal Engineer School ; because it was considered by some officers in high position in the Army at that time, who did not know all the circumstances of the case, that he had put himself in the position of attempting to over-ride the decision of the Commander-in-Chief, after consideration of the circumstances of the case. Such an idea was totally contrary to all Harness's principles, contrary indeed to his character : of him it was said by a high officer of State, that " no man fought more zealously against a proposition he considered to be wrong, as long as it was under discussion, and no man carried it out more loyally when it was decided."

To understand the position fully, it must be borne in mind that the great reform of the War Department had just been completed, under which the control of the Chatham School passed from the Inspector-General of Fortifications to the Commander-in-Chief. The Duke of Cambridge, who was then Commander-in-Chief, considered that in dealing with that establishment his proper adviser was the Deputy Adjutant-General of Engineers, as in the case of all matters connected with the military service of that Corps. Harness, on the other hand, felt that he could not satisfactorily carry on the duties of head of so important a school, in which not

only purely military engineering, but all the sciences of the day connected with construction and destruction were to be considered, unless he had direct personal communication with the Commander-in-Chief, and a voice in the appointment of the instructing officers, as had hitherto been the case under the Inspector-General of Fortifications; and there was a special argument for this view in his case, on account of the high positions he had held in various Government offices in connection with scientific questions.

After several cases occurring in which Harness's opinions were put aside by the Deputy-Adjutant-General, that officer appointed an instructor to the school without hearing Harness's opinion.

The following letters, from Colonel Harness himself, show his opinion on this subject and his deep feeling in the matter.

With these different ideas about the management of the school, of the Director and the Deputy-Adjutant-General there was friction from beginning to end of Harness's rule. He resigned the appointment after the last mentioned affair, and though he was induced to withdraw it for a time, the condition of affairs told upon him, and made him really ill, and he finally persisted in it and retired in June, 1865.

Royal Engineer Establishment, Chatham,
26th December, 1863.

DEAR SIR JOHN BURGOYNE,

About six months ago I wrote to you, strongly urging the necessity for the retention of Lieut.-Colonel ——— after the promotion he has now received, and in looking over some old papers of my predecessor's I find that he, on the 18th March, 1860, urged the same views of this question in replying to a note from you dated 17th March.

In selecting officers to instruct our young men we must discard the idea of the rank of the officer altogether, so far as some of the subjects at least are concerned. The field work officers, the adjutants, and officers for drill and discipline, may be chosen with reference to rank and changed without inconvenience, for there must be many qualified to choose from. But the officers for the survey, chemical, construction, and telegraphic, courses

must be those best fitted in the Corps in each case, without reference to rank. In order to diminish difficulty when changes are forced upon us, each of these officers should have an assistant, the survey more than one, periodically changed, with a view to qualify such for the instructorships. I know of no one at present who could take up all Lieut.-Colonel ——— duties here, and feel almost certain there is no one. It is the same with Captain ——— work, and for that very reason I some time ago recommended that he should have an assistant, who should be changed every six months. And, Colonel ——— is making the course of construction here which will occupy some years to perfect, and ought not to change hands unnecessarily.

There is no objection of this kind against changing the Director, as individually he teaches nothing.

If it be possible for me to write more strongly I shall be glad to do so.

Sincerely yours,
(Signed) H. D. HARNESS.

1st October, 1864.

DEAR GORDON,

I have just received your kind and considerate letter, and need not assure you that every word that comes from you is considered by me earnestly as the sincere opinion of an upright and straightforward man. I am sorry you did not see the correspondence in its entirety, but know the case from Sir John Burgoyne's conversation, and not from the letters. I am not sure, but believe you would then have thought my decision right, and am tolerably confident that in my place and not as an onlooker you would have acted as I have done, feeling much as I have felt. Of course, it is not the mere appointment of Colonel ——— whose fitness for the post may be left undisputed, that is intolerable. The cancelling of the appointment in ——— favour could not have altered my actions. The mode in which it was made, combined with other previous instances of neglect of my recommendations, determined me. It appeared to me, for a long time past, that the position I stood in as Head of that Establishment was not such as an honourable man charged with such very responsible duties could, of his own free will, remain in. You must, as all upright men do, recognise the principle that it is not honourable to remain in an important administrative position when

your recommendations are unattended to, and the support you receive insufficient from the authorities or department to which you have to refer. And there can be no administrative position to which this principle is more applicable than to the Direction of a large educational establishment for the young officers of a Corps, who have to combine, studious habits, and the instincts of studious and scientific men, with military character. Of course, I cannot consent to let the Deputy-Adjutant-General stand between me and the Commander-in-Chief in important questions connected with such an establishment. It does not occur to me to care—about such subjects as the regimental questions create—by whom they are decided, so long as the orders are in the name of the recognised Commanding Officer of our Corps, whether the Commander-in-Chief or the Inspector-General of Fortifications ; but those affecting the educational establishment are too important to be thus dealt with, and if my recommendations are not the best that the officers commanding the Corps can have upon that subject, I ought not to be there. I am not only a far older man than the Duke himself, or any of the Royal Engineer officers, except Sir John, whom he is likely to consult, but have probably thought more on the subject of our education than any of them. My views, too, are, I believe, in accordance with the sentiments of the ablest officers we have in it, and nothing could induce me to remain as an administrator anywhere to carry out the views of others instead of my own.

Very sincerely yours,
(Signed) H. D. HARNESS.

Alternative account of this matter, as drawn up by Colonel Sir G. Leach, K.C.B., R.E.

Colonel Harness resigned the command of the Royal Engineer Establishment in June, 1865. Various alterations had recently been made in the organisation of the War Department, one of them being that the control of the Chatham establishment passed from the Inspector-General of Fortifications directly to the Commander-in-Chief, whose immediate adviser in all matters connected with the military service of the Corps was the Deputy-Adjutant-General of Royal Engineers.

Colonel Harness had large views as to the Royal Engineer Establishment, and was keenly alive, not only to the necessity of giving to the younger officers the best possible instruction in the multifarious duties they might in after life be called upon to perform, but also of extending the instruction to those of the older officers of the Corps who, as opportunities offered, might desire to avail themselves of it. His aim was to collect together at Chatham as instructors such a body of men of talent and scientific attainments as would keep military engineering *au courant* with the progress of the times, and who would possess the confidence of the Corps as guides in all matters relating to military engineering and construction. With that object he deemed it essential that the Director of the Royal Engineer Establishment should have a controlling voice in the selection of officers who were to be appointed instructors. But, as different views were entertained at headquarters, and, as the anxieties of his position had seriously affected his health, he considered it desirable to resign his appointment as Director, greatly to the regret of those who knew and appreciated the good work he had done at Chatham.

CHAPTER IX.

RETIREMENT, 1865—1883.

BY

GENERAL COLLINSON, R.E.,

MAJOR-GENERAL A. DE C. SCOTT, R.E.,

MAJOR-GENERAL SIR THOMAS FRASER, K.C.B., R.E.

Soon after his retirement from the School at Chatham in 1865, Colonel Harness took a cottage in the little village of Worthing, near Basingstoke, to be, he said, half-way between London, and Sherborne in Dorsetshire. The Rev. Dr. Harper, who was then the Head Master of the great school at the latter place, had married Harness's eldest daughter; but one may also imagine that he had a desire to rest in both body and mind, after his troubles in endeavouring to carry out the reformation of that school against the ideas at headquarters. He felt the tone of treatment very deeply, and could not understand how it could be supposed by any person high in authority that he desired to escape from military control over his proceedings; for his loyal ideas of subordination to orders from his superior officer were some of the strongest elements in his character. He had been for more than ten years, previous to his command at Chatham, in personal communication with Secretaries of State in various

public departments, and although he had always given his opinions clearly and strongly on the questions before him, he had gained the high regard, and, indeed, the respect of the leading political persons he had been connected with. One of those said of him, that he "was the strongest opposer of anything he considered wrong as long as it was under debate; after it was decided he was the most loyal in carrying it out."

The following is an extract from a letter written to me previous to his retirement.—T. B. C.

Cologne,

24th September, 1864.

DEAR COLLINSON,

We were delighted to get your letter this morning, having arrived here too late last night to get letters out of the post. Since writing to you we visited the detached forts at Antwerp, or rather one of them, No. 4, which is very far advanced. The Engineer officer in charge, who was most attentive in his desire to explain everything, wished me to accompany him to No. 3, which is complete, but we had decided to go to Brussels that evening and would not change our plans; moreover, No. 4 gave me a thorough knowledge of their principles of action. They evidently assume, and perhaps rightly, that Antwerp may at some time have to undergo a terrific bombardment, and the preparations they have made to afford cover to troops from bombardment, in as advanced a position as these advanced forts, is on an enormous scale. He assured me they could cover under bomb proofs in that fort (requiring only about 450 men for its defence) 6,000 men with their field batteries and horses, so that they would be ready to leave the fort by the gorge and advance to the front if required at any moment. The accommodation for powder and stores under cover is all on a scale much larger than the requirements of the forts. The other arrangements in their construction that struck me is the very

ample provision made for free communication under cover in every possible direction. In the details I did not see anything that we have not. They make passages round their magazines as we do. But they establish a chamber at each end, which we do not, and which does not appear to me very reasonable. During peace they carry on the services by the chamber nearest the front, and furthest from the garrison. During seige this is to be closed, filled with earth, etc., and the service carried on from the other. It may perhaps contribute to the ventilation and dryness of the magazine to work it thus in peace. The ditch will have, when they allow it to accumulate by ceasing to pump, three metres (nearly ten feet) of water ; but this stagnant water will make them very unhealthy. The masonry of the redoubt is well covered, the covering plane being four feet higher than the plane of the top of the masonry. The embrasures of the caponieres are "Haxo," which no longer, now that we know the use of iron, please me.

I do not think we either of us cared much for anything at Brussels ; the great church is nothing after Antwerp, though it would have been very fine if seen before it. But we found Waterloo most interesting, notwithstanding that it was wretchedly wet. I feel sure the arrival of the Prussians was no surprise to Napoleon. If he had really believed that Grouchy had separated the Prussians from us, he would have thrown his army boldly round the English left as soon as he saw our position. He could have moved large bodies of troops round the rear of his front line without observation. We had a very good guide, a Belgian, who was eighteen years old at the time of the action, and engaged to attend the wounded after it—a very intelligent old man. But how disgusted one feels with that horrid Dutch mound. It has lowered the crest on the right half of our position, spoiled the hollow road which was an important part of it, and it prevents you from seeing the front of the position when standing on the most advanced part of it (by the two little monuments to

Sir A. Gordon and someone else) by coming right in the line of vision. Moreover, although you tell people it is an absurd labour to go up it, that it will destroy the perception of the slight features which compose the ground, they will insist on your going up it—which at sixty is a terrible labour also. We did Waterloo on Thursday, and on Friday (yesterday) came here. To-day we have admired the cathedral—its interior as it is, its exterior as intended to be—by the record at the eau-de-Cologne shop. The design and effect of this cathedral and that of Antwerp are very striking, but the artistic details to which guides direct attention are not merely uninteresting, but disgusting, as unworthy to divert attention from the noble buildings in which they are placed. There is one thing that at Antwerp almost excites disgust against them as a people. They appear to honour Rubens as if he were superhuman, and they have put up public statues to Rubens and Teniers, and none apparently to any statesmen or warriors their country may have given birth to. It never would have occurred to me to think Rubens worthy of a statue in any other place than a painting school. Have not you the same feeling?

Very truly yours,
(Signed) H. D. HARNES

P.S.—We shall go to high mass in the cathedral to-morrow. I think it would be finer in the Antwerp cathedral.

From Sir John Burgoyne, on his appointment as Field Marshal, to Sir Henry Harness.

War Office,
17th March, 1865.

MY DEAR COLONEL,

I prize very much the congratulations I receive on any occasion from one I respect and esteem so much as I do *you*.

The appointment comes to me very unexpectedly, and the notification of it conveyed in a very gratifying note from Lord Palmerston.

Though it is now made an *honorary* appointment, it is not the less a very *honourable* one, and I must take it as a great compliment.

My dear Colonel,

Yours faithfully,

(Signed) J. F. BURGOYNE.

16, Bruton Street,

London, W.,

July 4th, 1866.

MY DEAR COLONEL HARNESS,

One line more to say how sorry I am that our official connection is finished, but not, I hope, our personal friendship.

Yours sincerely,

(Signed) GRANVILLE.

The Cattle Plague of 1866.

The circumstances under which Colonel Harness was appointed to superintend the special "Cattle Plague Department" formed under the Privy Council in 1866 are mentioned in a "Memoir of Colonel Harness's Life," in the following terms, *quoted also in the Introduction* :—

"About that time, 1866, the great cattle plague disturbed the whole country, and gave the Privy Council much anxiety and trouble to meet the requirements for its isolation and extinction. Lord Granville, then President of the Council, in conversation with Colonel Harvey on this subject, mentioned the circumstances of General Harness's connection with it: how, when in his difficulties, he remembered that Lord Palmerston used to say in such cases, 'Can't you get an Engineer officer to help you?' So he went to the Duke of Cambridge, and (having known Harness before) asked for his services, understanding that he was unemployed. The Duke readily consented, speaking at the same time highly of Harness; on which Lord Granville said, 'Harness was the very best man of business he ever had to deal with,' and 'that he had known him from time to time for many years,' adding that he 'had always found the Royal Engineers excellent men of business.'"

From Lord Granville to Sir Henry Harness.

March 19th, 1866.

MY DEAR HARNESS,

The Council Office is overwhelmed with cattle plague work. We wish to create a department for a time to undertake all that the new orders of Council are likely to enact.

This department will require a first-rate and experienced man at the head of it, and I have some hopes that you will consent to undertake this business; particularly as it is to be hoped that it will not assume a permanent character.

If you can come up to-morrow to discuss the matter, you will find Bruce at the Council Office at 4 p.m.

I shall be at the Council Office on Wednesday, at 2 p.m.

Yours sincerely,

(Signed) GRANVILLE.

P.S.—I need not say how glad I should be to be again in official connection with you.

The extent to which this plague had grown, and had affected the cattle and meat business of the country, can be judged by the strength of the department formed to deal with it, and over which Harness presided, as a secretary of the Privy Council. There was a medical superintendent, with two inspectors; a central office of four clerks, with power to take on "stationers' clerks" from time to time as necessary; a statistical office of sixty-five permanent clerks, and twenty temporary, with power to take on temporary clerks; and a legal adviser. Besides which, two or three officers of Engineers were specially employed. The statistical branch had already existed as a "Veterinary Department."

Receiving stations were established at the ports where cattle from abroad were landed, under local supervision; and regulations made for the inspection and transit of cattle, all over the kingdom, all under local officers, reporting to the department in London. These regulations and the compulsory slaughter of cattle naturally caused a good deal of correspondence, and continual personal interviews between the persons thereby affected and the manager of the department.

And, the control of it, to carry out the intentions of the Government, and at the same time deal as justly as practicable with the unfortunate owners, required a clear head, a firm will, and an inexhaustible patience.

There are few papers to illustrate this work, lasting the greater part of the year 1866, towards the end of which the unceasing supervision and the firm hand controlling it had virtually stamped out the disease in the country.

The memorandum of Colonel Harness to the Privy Council in October, 1866, is a good record of the work done, as well as of the modified arrangements for the supervision of the traffic, under the improved circumstances, recommended by him. The document also marks the wide range of circumstances and of trade interests concerned in the subject, and the clearness with which they were comprehended by the manager.

But the letter written by him to the President of the Council on the 8th November, recommending his own discharge, is the most characteristic of the high and conscientious tone of the man ; of, indeed, his nervous desire to avoid any suspicion of being an office-seeker. The final reply of the secretary of the Council records the opinion of that high body on his work.

Sir Henry Harness to the Duke of Marlborough.

MY LORD DUKE,

The cattle plague has now practically ceased in Great Britain, and your Grace will remember that some time since I pointed out to you that my duty in connection with it was a temporary duty, and that I should not like anybody to discover sooner than myself that my operations were no longer necessary.

I now believe that a separate department is no longer requisite, that something similar to the arrangement existing before I was called to town may be advantageously reverted to, and that it is right for me to request you to allow me to give up my present charges.

(Signed) H. D. HARNESS.

8th November, 1866

26th November, 1866.

MY LORD DUKE,

In closing this department, it is my duty to bear testimony to the very valuable services of the two gentlemen now serving in connection with it, who have been lent by other departments. Mr. Clodes, who has been lent from the Department of the Registrar-General, has had the entire charge of the statistical returns prepared since 12th May, and will continue his services therein, in order to complete the same and finish returns required to record the effects of a recent visitation of the cattle plague. Mr. Wingrave, of the Inland Revenue Office, has, under Mr. Childers, borne a principal part of this work of the grave correspondence of the offices, and executed it greatly to my satisfaction.

(Signed) H. D. HARNESS.

It is amusing (if one may use such an expression towards so august a body) to mark the dry tone of the Treasury minute on this occasion: "The Paymaster-General has been directed to pay the salary and allowances of Colonel Harness as Superintendent of the Cattle Plague Department, up to the 26th *ult.* and no longer." No mercantile firm could have done it more neatly.

*The Governorship of Bermuda—Lord Carnarvon to
Sir Henry Harness.*

[PRIVATE AND CONFIDENTIAL.]

Windsor Castle,
12th December, 1866.

MY DEAR SIR,

The Governorship of Bermuda is now vacant, through the transfer of Colonel Ord to the Straits Settlements. It will give me great pleasure to submit your name to the Queen for that important office, if you find it agreeable to yourself and consistent with your own plans to undertake the service. Though I have not the pleasure of a personal acquaintance, I know that I shall be placing the Colony in good keeping.

Please to send your answer to the Colonial Office.

I remain, my dear Sir,

Yours faithfully,

Colonel Harness, C.B.

(Signed) CARNARVON.

Worting, Basingstoke,
15th December, 1866.

MY LORD,

I have the honour to acknowledge your note of the 12th inst., which has been received by me this morning, and to express my great gratification at the confidence your Lordship has evinced in me. Though still able and willing to serve the Government in any part of the world where, if possible, my services might be really required, I am no longer desirous to go to a great distance from home for personal advancement, and am therefore induced to decline the offer you have so kindly rendered to me.

I have the honour to be, my Lord,
Your obedient servant,

The Earl of Carnarvon, (Signed) H. D. HARNESS.
etc., etc.

Royal Commission on the Water Supply of London.

Towards the end of the year 1866 the Government of the day decided to appoint a Royal Commission for the purpose of inquiring into the question of the water supply of the metropolis and the principal towns, and Harness became a member of the Commission.

The circumstances which led to his appointment are disclosed in the following correspondence :—

War Office,
28th November, 1866.

SIR,

I am directed by Secretary Lieut.-General Peel to acquaint you, for the information of the Field-Marshal Commanding-in-Chief, that Her Majesty is about to issue a Royal Commission—for the purpose of ascertaining what supply of unpolluted and wholesome water can be obtained by collecting and storing water in the high ground of England and Wales, either by the aid of natural lakes or by artificial reservoirs at a sufficient elevation for the supply of the large towns—with a view to its reporting; firstly, which of such sources is best suited for the supply of the metropolis and its suburbs; and, secondly, how far

the supply from the remaining sources may be most beneficially apportioned among the towns.

It is desired that a military Engineer should be associated with this Commission, and General Peel would be glad, therefore, if His Royal Highness will name an officer of the Royal Engineers whom he could recommend for the duty.

I have the honour to be, Sir,

Your obedient servant,

The Military Secretary, (Signed) EDWARD LUGARD.
etc., etc.

Minute Paper to Colonel Keane, D.A. General, R.E.

It has been communicated to me that application has been made for the appointment of an officer of Royal Engineers to be a member of a Royal Commission to consider the great question of the best means for obtaining a water supply for London.

I would beg to propose for His Highness's consideration the name of Colonel Harness as one from rank and capabilities would be very eligible, if His Royal Highness has not already fixed on any other.

It is understood that Colonel Harness's occupation on the cattle plague arrangements are so nearly terminated that he could readily undertake this new service.

28th November, 1866.

(Initialled) J. F. B.

The first Commission, issued on the 24th of December, 1866, was revoked, and a new Commission was issued on the 4th of April, 1867, amending the reference, which in its final form stated that the Commissioners were appointed for the purpose of ascertaining what supply of unpolluted and wholesome water could be obtained by collecting and storing water in the high grounds of England and Wales, either by the aid of natural lakes or by artificial reservoirs at a sufficient elevation for the supply of the large towns, and to inquire into the present water supply to the metropolis, and whether there are other districts in addition to the high districts of England and Wales from which a good supply of unpolluted and wholesome water could be obtained: and to report, firstly, which of such sources were best suited for the supply of the

metropolis and its suburbs ; and, secondly, how the supply from the remaining sources might be most beneficially distributed among the principal towns.

The members of the Commission other than Harness were the Duke of Richmond, Sir John Thwaites, Sir Benjamin Samuel Phillips, Thomas Elliot Harrison, and Joseph Prestwich.

Harness, who had expressed to the Deputy-Adjutant-General his gratification at his selection for the appointment, entered upon his duties with characteristic zeal and energy, and, as is evidenced by the memoranda which he has left behind, with exceptional capacity for due appreciation of the vast body of evidence and information which was placed before the Commission during the course of their inquiry and which was finally dealt with in their report : one of the ablest of those relating to the water supply of London which have been issued.

The inquiries of the Commission were practically limited to the water supply of the metropolis, as it was soon seen that the question of the supply to the provincial towns was so large that it would have been the work of years to investigate. The report bears date the 9th of June, 1869.

The Commissioners examined witnesses and received evidence regarding various schemes for the supply of water to London from places outside the Thames basin, viz. : a project by Mr. Bateman, C.E., for storing and conveying water from the mountainous districts of Wales ; one from Messrs. Hemans & Hassard, of a similar character, for supplying water from the lakes of Cumberland and Westmoreland ; Mr. Hamilton Fulton's plan for taking water from the upper sources of the Wye in mid-Wales ; that of Mr. George Remington, proposing to draw a supply from the hills of Derbyshire.

Of projects dealing with the Thames, or sources within the Thames basin, they had before them those of Messrs. McClean, Mr. Bailey Denton, Mr. Brown, and Mr. Bravender,

which dealt with the Thames and its tributaries, and also Mr. Mylnes' scheme for storing water in the upper basin of the Lea. They further took notice of suggestions made by the Rev. Mr. Clutterbuck and Messrs. Homersham, P. W. Barlow, and Meeson, for procuring water from springs in the chalk, or wells in the chalk and oolite.

Other gentlemen, viz., Messrs. Hannell, G. W. Ewens, and Telford McNeil, came forward with proposals for the utilisation, as sources of supply ; of the chalk and Bagshot sands near Basingstoke and Farnham, as well as chalk springs near Havant.

The evidence given before the Commission by a number of the most eminent chemists and pathologists, with reference to the quality of the waters of the Thames and the Lea, was conflicting and highly technical in character. Harness drew up a memorandum embodying his conclusions as derived from this evidence which is remarkably lucid and logical, as the following extract shows.

He states : " I have endeavoured to consider the evidence given by the physicians and chemists we have examined, and as far as may be possible without chemical knowledge, to realise the views by which each is influenced in forming an opinion. Some knowing that the Thames continually receives impurities, which if unaltered would render its water unwholesome, and being convinced that the perfect removal of the hurtful qualities of those impurities cannot be demonstrated, object to Thames water as suspicious. Others, while conscious that the complete alteration of the impure matter cannot be proved, infer with more or less confidence, from chemical observations, that such purification has taken place, and others assert, that the water is good and wholesome because no objectionable impurity can be detected.

" The first of these views of the subject appears to me the most logical, but the second is in accordance with the only mode of reasoning applicable to numerous questions in practical life. The third has little weight with me."

In their report dated the 9th of June, 1869, the Commissioners objected generally to schemes which were based on sources outside the Thames basin, because they held that the latter contained a sufficient supply of water for all possible contingencies, provided that the ordinary volume of the Thames and the Lea were supplemented by storage reservoirs for flood water, and that the subterranean water from the chalk to the south and south-east of London, and from the green sand, were utilised. In regard to quality, they stated ; that there was no evidence to lead them to suppose that the water supplied by the companies was not generally good and wholesome ; that its hardness constituted no vital objection to its use for general, household, and manufacturing purposes ; that filtration was essentially necessary to secure good quality, and was susceptible of improvement, as it was in many cases imperfectly carried out ; that when efficient measures for excluding the sewage and other pollution from the Thames and the Lea and their tributaries, and for ensuring perfect filtration were adopted, water taken from the present sources would be perfectly wholesome, and of suitable quality for the supply of the metropolis.

As to quantity, the Commissioners estimated that a population of from 4,500,000 to 5,000,000 would probably have to be provided for, though they believed the time for such extended provisions would be very remote. They calculated that 200,000,000 gallons per day was the highest demand which need reasonably be looked forward to for the metropolitan supply.

They recommended that the constant service system should be promptly introduced, and as it could not, in their opinion, be effectually introduced so long as the supply remained in the hands of private companies, and for other and general reasons, they recommended the constitution of a public body with full powers in respect of water supply, rating, and the purchase of the existing works.

The phenomenal growth of London which has taken place

since the Royal Commission of which Harness was a member reported on the question of the water supply, has falsified their predictions in regard to the population of the future and the quantity of water which would be needed. The conclusions of the latest Royal Commission which has dealt with the subject, and which furnished a report in 1893, are that 11,250,000 people, representing the population of the City and Metropolitan police districts, and known as Greater London, and the positions of the Metropolitan water companies' districts outside Greater London in 1931, will need 420,000,000 gallons of water daily. It is, however, somewhat remarkable that the views of the Commission regarding the quality of the water derived from the Thames and the Lea are couched in terms almost identical with those employed by the Duke of Richmond's Commission.

A. DE C. S.

The Siege Operations Committee, 1876.

The last of the official duties performed by Sir H. Harness was by no means the least important. In August, 1876, he was begged to accept, and accepted, the Presidency of the Siege Operations Committee. Various subjects that had come up for solution as the outcome of the Great War of 1870-71 were being considered separately by small committees, and the necessity for treating all as a great Army question, of equal interest to every branch of the Service, rather than by the separate branches concerned, was apparent to the Commander-in-Chief and his military advisers, and was also in accordance with the general movement in the Army to effect the intimate association of the Ordnance Corps with the other branches, and to weld the whole together for a common purpose.

The names of the members of Sir H. Harness's Committee, and of those who replaced him and others, will be recognised

as showing the importance attached to the inquiry, and may be worth recording here. They were :—

General Sir F. Chapman, G.C.B. (who succeeded Sir H. Harness).

Colonel (lately General Sir W. O.) Lennox, V.C., K.C.B.

Colonel (now Lieut.-General Sir H. A.) Smyth.

Colonel (lately Sir John) Stokes, K.C.B.

Colonel (lately Sir William) Crossman, K.C.M.G.

Lieut.-Colonel (now Lieut.-General Sir Henry) Brackenbury, K.C.B.

Colonel G. Shaw, R.A.

Colonel Trent, Inspector-General of Musketry.

Colonel Adams, 86th Regiment.

Colonel (lately Major-General) P. Smith, Grenadier Guards.

Colonel E. Maitland, R.A.

Captain T. (now Sir Thomas) Fraser, R.E., was secretary to the Committee.

Having in the first instance obtained the written evidence of the most competent officers of the Army on the subjects of the reference, Sir H. Harness, thanks to the clear judgment that distinguished him, perceived that conclusions could only be arrived at by the Baconian method of actual experiment.

As the subject developed, the extreme importance of the influence of modern musketry, shrapnel, and case, fire, in the sphere of investment engagements, led to the adoption of a system of experiments previously unknown in this country, and one tried only recently, and on a very small scale, on the Continent.

It may be described as the accurate record of the dispersion of fire over the ground (which is the practical question as regards its effects on troops) instead of its record on a vertical target as had heretofore prevailed.

The tactical importance of these experiments, carried out either by great columns of canvas targets, or, better still, by using large areas of sand targets of great width and nearly half-a-mile in depth, and extending up to ranges of 3,500

yards, threw, for the first time, an exact light on the various questions of exposure dependent on the nature of military formations, while experiments from rests—at night, in the dark, by moonlight, and by electric light—showed the limits of effect which are practically attainable under these conditions.

In addition, the ballistics of the Martini-Henri rifle (by far the best of its day), such as angles of descent, penetration, time of flight, drift, angle of glance, etc., were obtained up to the limit of its range by actual observations. There was further a confidential trial of European military small arms of different calibres, which were so conclusive as to the ballistic advantages of using a smaller bore, that it may be said to have initiated the experiments that led to the determination to reduce that of the Martini-Henri rifle; a reduction, that after the invention of a large envelope, has been carried to the present limit in the infantry arm.

The results obtained by the German siege artillery in the war of 1870-71, and later at the Graudenz experiments, had indicated that the existing methods of scarping ditches were no longer applicable, and that new departures in the construction of works of defence were imperative, to meet the greatly enhanced capacities of modern siege artillery. The views of the president on this subject are recorded in the following letter of his, addressed to Colonel (now Lieut.-General Sir Henry) Smyth, R.A.

“Thank you very much for your letter. I am quite of opinion that it is necessary for us to be able to say what our weapons ought to do, but firing with them against a masonry wall covered as a revetment ought to be, seems a concluding rather than an initial experiment. The general inquiry ought to precede the particular one, and the direction of our thoughts is first towards the circumstances on which any particular result would depend, and how far it would be influenced by each of those circumstances. Thus it seems to me probable that the breaching power of a single shot fired

from a range of 1,600 yards with a charge and elevation to produce an angle of descent of 15° , would be twice as great as a similar shot fired with the charge and elevation required for the same angle of descent with a range of 400 yards. How shall we form a target that will give us a good measure of penetrating force? There must be something better adapted to this inquiry, and cheaper, than a masonry revetment. A canvas screen in front of such a target would enable us to determine exactly the angle of descent in each case. My impression is that there is a range of maximum effect for breaching with curved fire, and that this should be certainly known before we fire at masonry, and that one would then like to build the wall of different descriptions of masonry, etc."

"I was under the impression that the German siege gun threw a projectile of nearly the same weight as ours; and if this be so, and either is superior in effect to the other, can probably trace the cause by considering the differences in construction. It is a long time (some years) since I have seen the papers you referred to; the last time I saw them the original chapter under the heading you mention had been much altered, not merely by following the changes that had taken place, but by giving a particular and detailed character to that which had been designed only as a general description, sufficient as a basis for reasoning on fortification."

"I think we should get the results of the experiments with the Snider in India, and hope we shall be able to get some with the Martini-Henri at home."

"Very truly yours,
(Initialled) "H. D. H."

Accordingly, after preliminary trials, revetments covered to a much greater extent than formerly were built, and after a necessary interval for hardening, were breached by the then siege train M.L.R. howitzers of 6'3 in., 6'6 in., and 8 inch.

With the last named nature, breaches which formerly had

to be effected from positions only a few hundred yards from the wall were carried out under conditions of incomparably greater difficulty from unseen positions, at ranges up to 2,500 yards, by methods of back laying, and with extreme rapidity, and economy of weight of ammunition.

Nor were experiments confined to these questions alone. A number of collateral subjects were submitted to the test of practice, such as the vulnerability of balloons to the shrapnel fire of field artillery; the angle of glance of howitzer shells under various conditions and against different surfaces, as well as the relative effect of bursters of powder, and high explosives, on concrete, brickwork, and masonry.

The methods of procedure, the preparations, and most of the experiments themselves, were carried out and recorded under the presidency of Sir H. Harness, in spite of the exertions that work at Lydd imposed on him and the Committee; but towards the end of 1880 the president felt that age and failing health alike compelled him to seek relief, and though begged in the most flattering terms to endeavour, if possible, to close the labours of his Committee, now practically complete, he felt compelled to resign.

The following letters from Field-Marshal Sir Lintorn Simmons, then Inspector-General of Fortifications, best explain the value of the services rendered by Sir H. Harness.

The first is as follows :—

24th January, 1880.

MY DEAR HARNESS,

I have had Fraser here with me to-day, and have been looking at some of the experiments of your Committee which are most valuable, and will, I think, so far as I can judge, modify opinions as to the effect of fire, and as a consequence the proceedings of attack and defence. He tells me that he thinks all the experiments will be completed before the end of June, and that the Committee may finish their report in August.

Now I think if you could possibly continue, it would be of immense advantage that you should assist in the final deliberations and sign the report. A new man taking up the work would not have the advantage of

being thoroughly conversant with all that has passed. In asking you, if you can, to continue the presidency, I might say that the practice is conducted with so much care, and the records are so complete, that there need be no occasion for your personal exertion in attending at Dungeness. With the diagrams and full explanations you will have ample material for maturing your conclusions, and the members have all worked so admirably and congenially under your guidance that I should be sorry to risk any change.

At the same time, I have no right to ask you to do anything that may be injurious to your health, or distasteful, so that I am entirely in your hands, and whatever you decide I shall be perfectly content.

Believe me,

Ever yours most sincerely,

(Signed) J. L. A. SIMMONS.

But in spite of the desire expressed that Sir Henry might find it possible to continue his labours to the end, he was unable to do so, as recognised in the following letter :—

“ 29th January, 1880.

“ MY DEAR HARNESS,

“ Much as I desire to get the benefit of your large experience and sound judgment in the report of the Committee, I cannot, after what you urge, press you to continue the presidency.

“ It is with sincere regret, I am sure, that your colleagues will cease to work under your guidance, and I cannot tell you how sorry I am, after now forty-four years since our first acquaintance, to think that you, who, I can safely say, did more than any other instructor under whom I was at the Academy to inspire me with a sense of duty and exactness, and to whom, therefore, I have always felt most deeply indebted throughout my whole career, should be giving up work.

“ It makes me feel that I also must soon give up, or my work will overpower me.

“ Hoping, however, that I may still have an occasional glimpse of you, and that you may long be spared to be the comfort and pride of your family,

“ Believe me ever,

“ Yours most sincerely,

(Signed) “ J. L. A. SIMMONS.”

And, the official thanks of the Secretary of State for War

were communicated to him by Lord Eustace Cecil in the following terms :—

“ War Office,
“ 17th March, 1880.

“ SIR,

“ I am directed by the Secretary of State for War to express to you the extreme regret with which he has received your letter of the 3rd ult., in which you tender your resignation of the presidency of the Siege Operations Committee, for which your long and varied experience so eminently fitted you.

“ Under the circumstances stated therein, the Secretary of State has no option but to accept your resignation, but he desired me to express his thanks for the very efficient manner in which you have guided the deliberations of the Committee, and which deliberations will, he anticipates, result in permanent benefit to the service.

“ Colonel Stanley has noted with much satisfaction the cordial co-operation you have received from the members of the Committee, and the assistance rendered by the Secretary.

“ I have the honour to be, Sir,

“ Your obedient servant,

(Signed) “ EUSTACE G. CECIL.

“ General Sir H. Harness, K.C.B., R.E.,

“ Wortley, Basingstoke.”

General Sir F. G. Chapman succeeded him, and wound up the work of the Committee by the end of the year.—T. F.

The following is characteristic of the soldier in the man.

DEAR MR. ———,

A part of your sermon this morning gave me so sharp a shock that I think you ought to know the feelings with which an old officer bears such expressions of opinion. A high sense of your usefulness renders me the more anxious, by thus writing to you, to make you aware of the light in which some are likely to view them.

You said these or similar words :—

“ . . . when the seven bishops were compelled to yield to that wretched King James, of whom England was so well rid. . . .”

“ . . . When very recently a bishop of our own Church was taken to task for his opinions by one in authority.”

We cannot listen to an illustration from history so nearly connected with us without identifying ourselves with the case; and however rightly the bishops acted in conscientiously resisting the command of their Sovereign, to the soldiers of that time the question between him and the bishops was not one for their consideration: their allegiance was the only question for them to deal with; and you can hardly conceive the pain with which an English officer hears an English Sovereign of a recent period spoken of with reprobation from a pulpit whence soldiers especially are instructed.

In like manner, questions between bishops and statesmen of the present day may be subjects for conversation among us as we read the newspapers: but they are not subjects on which any right thinking officer, however learned, would attempt to form an opinion by which his action as a soldier would be guided; and soldiers should only be led to regard them as political questions between persons in authority in the State, with which, as soldiers, they have nothing to do.

Domestic life and Scripture history must be rich with illustrations free from these objections.

Forgive my writing thus to you. If I were not sensible of your valuable exertions and earnest desire to do good, you would not receive this note.

Very truly yours,

(Signed) H. D. HARNESS.

Evidence of Design in Creation.

[The views of a man of Sir Henry Harness's character, formed at the close of his career, are always interesting.—ED.]

Worthing,

16th December, 1866.

I have long wished to try, by inferring from the extensive evidence of design in the Creation that it exists throughout it, and then—tracing the natural results of the influences to which man is here, by design, exposed, on his moral being—to learn

the will of his Creator with respect to him. And the controversy now raging between the parties in our Church induces me to employ my present leisure on this subject. There is, however, a dread upon me that the manuscript, of my reflections, if found unfinished by my children, might induce them to think that I really undervalue the teaching of our Saviour and of the Scriptures. This, according to my judgment, I do not do; but the subject cannot be worked out in the manner in which it is my desire to work it, except by assigning a subordinate position, in the first instance, to those *sources* of knowledge.

The two following letters were written by Sir Henry Harness to a bishop of the Church of England, long since dead :—

2nd February, 1867.

MY LORD,

You might probably think it presumptuous in a layman to write the enclosed to you, and it is my wish to prevent such an impression.

With the exception of the three first paragraphs, the whole was written as a sort of memorandum for my own satisfaction, to enable me to know clearly what my religious opinions had become after a somewhat long and active life. It occurred to me that this memorandum might be useful to one of our bishops, as showing the opinion of one layman at the present time; and as it only cost me so much of my leisure as was necessary for transcribing it, with some trivial changes, as a letter, and need not give to your Lordship even the trouble of perusal, I have not thought it a presumptuous act to send it to you. . . . In the discussion now dividing the clergy of our Church, the disputants appear to lose sight of the effect which those discussions may be producing among the laity.

It is not, perhaps, too much to say that the great body of the laity—all except a few partisans in these disputes—are becoming more or less alienated from the Church of

England in consequence of them. It is possible that this result, by obliging the laity to think for themselves, instead of trusting the teaching of the ordained members of the Church—may be beneficial ultimately to the religious condition of the people; but such a result, so produced, must be fatal to a Church Establishment. Besides these disputes, there are apparently other circumstances which are alienating the people from our Church; for, those streets of London in which our mechanics principally live may be seen on Sundays filled with idle men, who appear to have given up the practice of attending the services of the Church.

It is the consideration of these things that induces me to send to you, as a letter, some reflections which were written down for my own satisfaction only, but which it has occurred to me may prove useful to your Lordship, by showing you the state of mind of one layman, who believes from his observations of others that his opinions are in accordance with those of many others on the same questions.

(Signed) H. D. HARNESS.

His Reflections.

When two intelligent persons, each competent to arrive at a sound opinion on some subject, continue to maintain, after free communication with each other, opposite views with respect to it, our wish, if we are interested in the matter, is to endeavour to ascertain exactly how each has arrived at his conclusion; and in questions of science, it is generally supposed in such cases that some doubtful point remains to be solved, and that neither has been justified in asserting an absolute opinion.

A conscientious teacher in science puts before his pupils the views that have been suggested by others on disputed points, at the same time that he gives them his own impressions; and we should scarcely regard any scientific man as a satisfactory teacher who taught dogmatically his own

opinion on a question disputed by other men of equal learning.

I believe the above paragraph to express the intellectual habit, not only of the educated, but also of a large proportion of intelligent, mechanics, among the laity of the day ; and if so that it must indicate their mental condition with respect to the religious teachers of the day. In fact, the layman who earnestly desires to know what his faith should be, is forced to the conclusion that he cannot trust the teaching of any Church or any individual, and that he must consider the subject for himself.

He finds the teachers in his own Church divided into parties on both *doctrines* and *forms*. As to the former, he perceives their differences to be due to their respective interpretations of the meanings of portions of the Scriptures, which, if not now rendered plain to the comprehension of all by the consideration they have received from the learned men of many ages, he must conclude ought not to be regarded as inculcating doctrines that should be dogmatically taught. With respect to the latter, he observes that their views are dependent on the degree of authority they respectively attach to various human institutions and practices, to which laymen generally may be assumed to attach but little importance.

He is desirous, then, to endeavour to arrive by himself at some definite conclusions with respect to the intention of his Creator in giving him existence ; and as to the habits of thought and conduct which he should strive to acquire that his life may be in accordance with the will of that Creator.

To endeavour to learn the will of his Creator, and to endeavour to the utmost of his power to do that will, becomes, then, his religion.

His own heart and mind, and the works of the Creation by which he is surrounded, which are beyond all doubt intended for his contemplation and instruction, are the first subjects for his study, because their authorship cannot be disputed.

The Scriptures have been handed down with reverence from

past ages, and they have been during a long period accepted as having divine authority by the good and learned among the most civilised and educated portions of mankind. He feels no difficulty in believing that the Creator may have inspired human writers for the instruction of His creatures; but that this has been the case, or that all the received Scriptures should be accepted as the result of inspiration, or be considered of equal authority, he cannot assume to have been rendered absolutely certain. He will admit that the conviction which is felt to accompany their teaching may be regarded as evidence of their truth, but he will desire that this apparent conviction should be confirmed by the impressions that may be derived from the works of the Creator.

The lessons to be derived from the Creation become then his first and most important study; and while allowing the highest authority, among writings, to the Scriptures, he nevertheless accords them an inferior place to the former, and prefers in his first consideration of this great question to refer to them more for suggestion and corroboration than for direct instruction.

The existence which has been given to him, and which he regards as himself, is that inner being which remembers, combines, reflects, and reasons upon and is variously affected by the objects presented to its contemplation through his bodily senses. Those bodily senses by which he becomes acquainted with the Creation beyond himself he only possesses in common with beings who appear to be inferior to him, and they are possessed by some of these beings in far higher perfection than by him. He can, in some cases, perceive the object with which this higher perfection of a sense has been given, and he infers that the degree of perfection of the senses allotted to him is suited to the purpose of his creation. He finds those senses sufficient to enable him to perceive an infinite variety of created objects, and to communicate with other beings resembling himself. He has no difficulty in perceiving that there is a wide difference

between the beings like himself and those with whom they are allied by the similarity of bodily functions. That this difference consists in that inner, or intellectual and moral, existence, of which he is himself conscious, and of which no positive signs are observed by him in any of the living beings upon the earth except mankind.

With mankind he can communicate by conversation and by writing. By the writings of those no longer on the earth he is able to become acquainted with the thoughts of men who lived at different periods of time ; and by these means and his observations of his contemporaries he is able to form some judgment of his fellow-beings, always limited, however, by the experience and power of his own inner existence.

He can appreciate the efforts of intellectual powers which are not superior to his own ; he can understand feelings with which his own experience enables him to sympathise ; but he is unable to judge of the influence on the inner existence of another being of intellectual powers of reason and imagination very superior to his own, or of a capacity for affection, of a need of support, of a sense of self-reliance, and of passions very different in intensity to those with which he is acquainted. He believes, from the actions of others and from their expressed opinions, that great differences exist in the intellectual, moral, and sensual capacities of men, and is obliged, therefore, to conclude that his power to judge his fellows is very limited.

At the same time he observes that the general similarity is so great that he cannot doubt that they have been created with the same object as himself. Their physical, intellectual, and moral qualities, though varying in degree, appear to be in other respects similar to his own, and many of the influences attending their existence on earth are the same for all mankind ; and it is a necessary inference that the Creator has designedly subjected them to those influences.

The impressions received through the senses are the food of his inner existence of his spiritual being. The evidence

of design in those works of the Creation which are open to his contemplation assure to him that they are the work of an intelligent Creator. When once the evidence of design is accepted as conclusive in this point, the problem as to where the work of design begins becomes unimportant ; the knowledge which he is able to obtain of minute organisations, and the knowledge which astronomy gives to him of the order and arrangement established among enormous bodies moving at vast distances from him, teach him that the range through which the wisdom of the Creator is applied is beyond his comprehension. He is forced to consider the possible extension of space and time, and to acknowledge the fact that both must be infinite ; and also to acknowledge that it is beyond the limited intellectual power given to him to conceive infinity. Although infinity and eternity are beyond the grasp of our comprehension, we cannot but perceive that time and space can have no limit. So in like manner it seems impossible to doubt that the variety and excellence of the moral and intellectual world are as illimitable as that physical world which our faculties are able to contemplate. It is most probable that beings exist with capacities of which we can have no more conception than the worm or the limpet has of the reason, imagination, and affections of the human race.

Where in the gradation of beings does immortality commence ? When does improvement become continuous, and changes occur without the intervention of death ?

He is thus prepared to receive other lessons from good authority, that may require him in like manner to believe things incomprehensible, but not repugnant to his reason. He cannot doubt that it is the will of his Creator that the reasoning faculty allotted to him shall be used in distinguishing, as far as he is able, truth from error.

He also receives through the senses impressions which teach him that he is capable of misery and of happiness. The wants of the body force the intellectual powers into action : the ease, leisure, and comparative freedom from

care, derived from the successful employment of those powers by others, produce the desire for their improvement in himself, and he observes that some men derive their greatest pleasures through them. He perceives that the intellectual qualities of men differ not merely in power, but in character; or rather, he infers this from perceiving that among those to whom intellectual pursuits afford the chief sources of enjoyment, the intellectual occupations in which they seek it are very different. He observes the common characteristic in each case to be that the pleasure is derived from novelty. Those who delight in investigating particular portions of the visible creation find the charm in new acquisitions and new discoveries; those whose pleasure is derived from making acquaintance with the thoughts and speculative reasonings of other men receive pleasure in proportion to the novelty, to them, of the ideas they meet with, and to the extent of the field which those ideas may open to their own reflection. He infers that the result of this difference in the intellectual characters of men has been to increase the knowledge of mankind; and while it is impossible for him to suppose that any amount of knowledge which man can acquire here could be useful to him in his future state, he fairly assumes that man's gradual advance in knowledge has been designed, and that, however insignificant the knowledge may be, the nature of man may be ennobled and fitted for a higher state by the intellectual development produced in acquiring knowledge.

His intimate intercourse with other beings like himself makes him sensible of the happiness to be derived through the affections. The wants of the body excite the energies of all the animals observed by him; but, so far as he can judge, man only is stimulated to the improvement of his intellectual faculties, and in man only are the social affections developed and rendered the principal sources of happiness and misery, and consequently powerful means of instruction. When through those affections he is rendered miserable, he becomes

convinced that he is not merely a plaything in the hands of his Creator, but that he has been made for some ulterior object.

It may be considered, then, that the influences to which men are subjected are intended to induce them to improve their intellectual faculties, but that the highest object for which they are being prepared is that for which they are educated through the affections. It seems reasonable to assert that the first impulses of a newly-created sentient being must be entirely selfish. The designed influences are to correct this. Is it possible to trace the design of the Creator by observing the natural influences of the affections?

The affections are first developed in childhood by the sense of our dependence on those who protect us; they are also called out by our playfellows through the common feelings of pleasure and pain, which produce mutual sympathies. And the community of interests and feelings continues to encourage the growth of the affections towards those with whom we are intimate as we advance in life, but the great development of the affections is that brought about by the relationships of marriage and parentage.

They appear then to be first brought into action through the sense of dependence; to be advanced by companionship with those having similar feelings and interests, and to be perfected so far as their instruction here is concerned, by the interest excited and continued in us for the well-being of our children. Now is it possible not to observe, in considering this last stage of instruction, that it approaches the condition which may be presumed to exist between a Creator and His creatures?

The state, then, to which we are gradually led is that in which the welfare of others is our chief desire, in which our own interests and wishes become subordinate to the good of others: and it will be observed that the sympathies excited by an ordinary intercourse with his fellow-beings is sufficient to produce this moral state in a great degree in many

individuals, and even in their early youth ; that men distinguish such persons approvingly as generous, chivalrous, noble, while those remarkable for an opposite moral condition are contemptuously described as mean, selfish, ignoble.

The lessons we receive from the inanimate Creation lead to the same conclusion. The beautiful and delicately-coloured landscape, the soft air, the bright clear sky sometimes varied with clouds which add to its beauty, the calm sea, direct our thoughts to their Creator, and fill us with grateful, beneficent, and happy feelings. But when the air is raging past us, the sea is troubled by a storm, and the sky made dark by clouds and rendered terrible by lightning, the objects which in their former state created happiness within us appear to threaten us with destruction ; and the most ignorant men are ready to compare these two extreme conditions of the elements to the difference between the men whose beneficent natures bring happiness to those with whom they mix, and the men who by their uncontrolled selfishness awaken our evil feelings and spread discomfort and even misery around them.

From the works of the Creation alone, then, we appear to be able to draw these conclusions.

Man is placed here to be prepared for another state, and the influences by which he is prepared tend to produce in him the desire to be the source of good to others, and to find happiness in the gratification of that desire. This may even be said to produce a sense of responsibility for the happiness of others, as well as an affectionate interest in others. They also appear to be intended to induce him to cultivate all the faculties that have been given to him at the same time that he is clearly taught to estimate very lowly the degree in which he possesses them. He is also clearly taught that he cannot judge his fellow-beings.

Among the numerous lessons to be learnt from the Creation there is one which we must not omit to contemplate. Among the various classes of created things open to our observation

there is not one in which many of those called into existence do not attain perfection : and it must therefore be thought possible that the moral and intellectual being which each man recognises as himself, may be duly improved by the influences to which it is subjected.

With reference to these conclusions one question will force itself upon us. How is it that, in the hands of an All-wise Creator, any education is necessary ?

With respect to this question it does not appear necessary that we should try to arrive at any further conclusion than that the influences to which man is, by design, exposed, tend to induce him to improve his faculties, and to find happiness in exerting them for the good of others rather than for his own. But it is not difficult to believe that even in the hands of an All-wise Creator such discipline and probation as that afforded by this world may be requisite for beings intended to exist in a future state, in a greater or less degree, as free agents. A preliminary residence in a world where as free agents, in a great degree, good and evil result from their actions, appears the natural preparation for such a future state.

It is impossible to form any judgment as to the effect which the consideration of the works of the Creation alone would have in leading man to attempt to hold communion with his Creator. There is no instinct apparently, nor anything in the Creation round him, which tells him to do so. But it appears all races of men, in all ages from which writings have come down, have in some form addressed themselves in prayer and adoration to a superior and unseen Power, and the remains of structures which appear to have been intended for such worship, but of which no traditions now exist, are found all over the world. Being sensible, then, of no instinct, and observing nothing in the Creation that would guide us to the worship of a superior Being, we are prepared to believe that the universal existence of the practice may be due to some instruction or revelation given to man

when first placed upon the earth, and the Scriptures, which are received by the most intelligent portion of mankind, thus account for it. They teach that the first parents of the human race held direct communion with their Creator ; and that the form of worship of the Jews, through whom these Scriptures are handed down to us, was arranged under His inspiration. The general teaching of those Scriptures is in accordance with the conclusions derived from the works of the Creation. To the ignorant man the terrible power of God is more apparent from the Creation than His love ; and the early Scriptures, written for a barbarous time, enforce the laws they promulgate by inspiring a dread of His vengeance. But the laws themselves command the entire love of the Creator and justice and benevolence to men ; and we also find among them, as in the Psalms, that good men looked to God as their friend, and by prayers and thanksgivings held communion with Him as such.

But whatever the teaching of the early Scriptures with respect to the Creator may be, there can be no doubt as to that to be derived from the works and example of Jesus Christ as related in the New Testament. It is not necessary to adopt it all as accurate and certain. There is enough from which we can adopt with certainty what Jesus meant to teach, and that intended for our moral guidance appears to be identical with the lessons we are taught by the Creation, viz., to believe in the mighty power and love of God, and to be filled with the desire to do good to our fellow-creatures, and to believe that we are intended for a future state in which there are many conditions.

Learned men, by whom, collectively, all the known writings of an earlier date than the Christian era have been examined, inform us that such extensive charity and forbearance as are inculcated by Jesus Christ in what is known as " the Sermon on the Mount " were never previously taught ; and we cannot but feel convinced that a society wholly formed of beings whose principles or instincts of action were in accordance

with that teaching, could know no discords ; that each individual of those beings might be trusted, or restrained as a free agent in proportion to his intelligence ; but that a charitable and loving disposition must have been indispensable to his admission among them.

We may then assume that the Scriptures contain lessons in accordance with the teaching of the works of the Creation, and that this is pre-eminently the case with respect to the records they contain of Jesus Christ. But it does not appear that He always confirmed the teaching of the Scriptures which He quoted, or treated them as infallible writings. Nor does it appear possible to all men to adopt any of them as such, though many learned men contend for their acceptance as "the word of God," not only in a general sense, but literally. Into this discussion it is not intended to enter further than to point out that the teaching of Jesus Christ must be received by Christians as taking precedence of all other scriptural teaching, and that when the record of His teaching admits of no doubt, nothing at variance with it should be received ; and that if in the writings of any one of His followers there are precepts at variance with the teaching of another follower of equal authority, such precepts should not be adduced in support of a doctrine.

To endeavour to ascertain what instructions and revelations have been bequeathed to us by this great teacher, is a task which each person should set himself in reading the Gospels ; but this paper is not written to bring the various passages together and to discuss them. With reference, however, to the two great questions which divide the English Church—the forms of worship and the spiritual nature of the sacraments—the impressions of a layman may be worth recording.

He believes that most men who have thought and felt acknowledge to themselves that their inner being, or spirit, has been acted upon at times by spiritual agency. When their reason—while approving of the thought or feeling—has

compelled them to assert "this thought, this feeling is God's work within me," and when we believe Christ to have said, as describing the action of the Spirit of God, "the wind bloweth where it listeth and thou hearest the sound thereof, but canst not tell whence it cometh or whither it goeth"—if the same teacher has said such spiritual influence shall accompany a specific act of faith—the man who with the above experiences believes in the teacher can have no difficulty in believing the spiritual accompaniments of a sacrament. And he is satisfied on other disputed points by considering that the teaching, the example, and the death of our Lord form spiritual food fitted for his nature or for his contemplation, and that in this sense he is bread from Heaven; and further, that such faith in the teaching of our Lord as will make him earnestly desire and endeavour to form his character upon it to such an extent that it shall affect all his impulses of thought and feeling, and consequently prompt all his words and actions, is a saving faith in Christ.

But the belief that there is occasionally a direct action of the Creator on the inner being of man, can only be adopted after long and serious consideration. So many and so great have been the delusions of men upon this subject. Through their imaginations, insufficiently checked by their reason, men have fallen or been led into the grossest errors. Every false religion must owe either its origin or its spread to this cause; and who can declare with certainty, with respect to all his thoughts and emotions, "these are from God" and "these are not"? Few, if any, can teach us how to distinguish them. But there appears good ground for the belief that all men in some rare cases in their lives have recognised the guiding hand of God; and reason must admit that if the Creator, without visible interference, is guiding the progress of individuals and of the race of men, it must be by the inspiration of the germs of thought into the minds of those whom he chooses for his work, or whom he is individually assisting.

How do thoughts enter the mind ?

All that can be recognised by the senses have some external cause : the sounds we hear come from some centre of sound ; the light we see, or by the assistance of which objects are perceived, has also its centre. It seems natural to infer that our minds are open to the action of a centre of intelligence which may be a creation of the Deity, as the sun is, or even our Creator, and as being our Creator, our Father Himself. And the last supposition would not appear unreasonable if all our thoughts were good and pure. May not the evil or impure form of bad thoughts be due to our own moral imperfection. Might not the same external action on a better person have produced good ideas. The sun gives light, warmth, health, and cheerfulness, but it also in places raises noxious vapours.

With respect to the worship of God, it is to be remembered that our Lord attended the synagogues and religious meetings of the Jews, that He prayed for others, that He inculcated prayer in private, and that He taught the simplest form of prayer for the use of His disciples. The natural inference appears to be that we should conform cheerfully with the arrangements for the public worship of God that are in use with the Christian community to which we belong, but that we should rely on our own earnest prayer for the grace and aid of God. If this be so, the great end of public worship may be considered to be the creating and maintaining in the hearts of a large community a due sense of religion, and for this object it is requisite that the form shall be adapted to the intellectual habits and even prejudices and tastes of the community to be instructed. It is impossible for man in his own heart to adore his Creator too highly, and if individuals require that adoration to be excited by outward acts of adoration or even by symbolical practices, such acts and practices may be proper ; but if offensive to any congregation their adoption in the public service of that congregation must be injurious, and prevent the religious feeling which it is the object of

public worship to excite. And as with the forms observed, so also should the teaching be adapted to the hearers.

It should be remembered that in any mixed congregation of English churches of the present day there will be some who do not accept the Bible literally. If a preacher quote it as literally "the word of God," as some do, he is probably at once regarded by many as a man of extreme opinions and somewhat of a bigot. If a preacher deprecate the use of reason in examining the assertions he may make; if he labour to explain things which to man's reason are inexplicable; if he introduce the results of a science with which he is unacquainted into his teaching, and show his ignorance of it in doing so, he cannot influence the thinking part of his congregation: and it must be remembered that there are no men more competent to use their reason, nor more likely to be able to check the inaccurate science of a preacher, than the working mechanics of the day; and it is greatly to be feared that over that intelligent body of our people the English clergy are losing their influence, because the most intelligent members of that body are not convinced by their teaching in our churches.

All men can be brought to take an earnest interest in their future state. Through the interest which can be thus excited, superstitious beliefs and practices are rendered powerful influences with the ignorant. But the reasoning man demands instruction which his reason can approve. It is not possible now to bring back those who are becoming indifferent to the teaching of the English Church, to the acceptance of any doctrine or dogma on the authority of the Church alone. Yet these men, if the teaching satisfied their minds, would be more deeply and more permanently interested than those whose acquiescence is more easily obtained.

To bring back these men to take an interest in religion by presenting it to them in the manner that shall convince and satisfy them, is the greatest present duty of the Church; and

those who can do this will be really the ministers of God to man.

H. D. H.

In this peaceful refuge at Worting he remained for more than sixteen years, that is, to within two years of his death; and among the few military friends who, either by neighbourhood or by occasional visits, kept up his intercourse with the outside world, one of the chief was the Rev. G. R. Gleig, who on his retirement from his long labours as Chaplain-General of the Army, had settled down near Strathfieldsaye, in that part of Hampshire, as parish priest, and spiritual and literary adviser, to the Duke of Wellington.

Mr. Gleig had a faculty of speech and of writing which gave him great influence over the British soldier; flavoured by the fact that he had been a soldier himself in his youth. And to these qualities he added an intimate acquaintance with men and books, and over all a genial disposition, which made both himself and his writings, and indeed his sermons, an instructive and also agreeable intercourse to all ranks of the Army.

The two following letters from Mr. Gleig to Sir Henry Harness are examples of the character of their intercourse.

Bylands, Winchfield,
21st March, 1882.

MY DEAR HARNESS,

It was a great satisfaction to hear, through Coe, that you had stood your journey to your new home well, and were settling down with as much of satisfaction as a man can experience who has been uprooted from a place in which sixteen years had been pleasantly spent, and who, in some sense, must feel that he is beginning over again his journey through life. Every day will more and more reconcile you to a change which brings you into constant communication with your daughter and her family. It is not, nor will it be so, with us. Little as of late we had been able to see of each other, the knowledge that you were within an easy drive of this place left the pleasant conviction on my mind that we

might meet any day. But now you are removed into a different sphere altogether, and, however desirous we may be of hiding the truth from ourselves, there it is. Well, if it be God's will that we should hold little personal communication with each other hereafter, the past is still our own; and as the old are said to live more in the past than in either the present or the future, we must find such consolation as we may in recalling hours pleasantly and profitably spent, some of them at Worthing and others at Deane. I miss you already more than I can tell, and I don't anticipate that the void will fill itself up in a hurry.

I almost wish, since you would leave us, that your new home had been nearer to Oxford. You will say that it is too late for you to form new associations, for friendships must be the growth of years. But I have a strong belief that in Oxford may be found a society as agreeable in every sense as all England could supply; and you are still young enough and sufficiently master of your own thoughts to enter into and rejoice in it. I think that even I, getting fast as I am into my dotage, should like to hear what the leading men in the University have to say on subjects which you and I have often discussed together. You must let me know from time to time, at second hand, how the new lights, if such there be, shine; and whether or no you find yourself wiser after watching the effect produced by them on your own convictions. This may set me thinking, an operation towards which there is here no inducement whatever.

I have just finished, for the second time, "Stanley's Life of Dr. Arnold." Arnold had many fine points about him, and as a schoolmaster he will for ever take the highest rank; but he was, like his friend Bunsen, a dreamer, and scarcely read history aright in his eagerness to render it subservient to his own theories. This portion of his mantle unquestionably fell upon his biographer; for Stanley was a dreamer likewise, so far at least as he thought it possible to build up a united Christian church with the discordant materials brought to hand by sects which hate one another. He was, however, a large-hearted man as well as a brilliant writer. Is he still remembered in Oxford?

Now God be with you, dear Harness. Take care of yourself for the sake of the many who love you, and don't fail to let me know, at your leisure, how change of scene and circumstances suit you. We jog on in our old quiet way, and have on the whole got well

through a charming but very treacherous spring. Our united love to Coe and Arthur.

Ever yours sincerely and affectionately,
G. R. GLEIG.

Bylands, Winchfield,
10th April, 1882.

MY DEAR HARNESS,

Coe's letter to Mary, received this morning, was a pleasant arrival, inasmuch as it brought a good report of you both; and just such a description of your new home as I expected to receive. The distant views from your hill are, as I well remember, beautiful, but I am not surprised to hear that just round about you there are not many features on which the eye would care to linger. It will be long before, with all your care, you make your immediate surroundings half so attractive as Worting—your Worting cottage appeared to me the nicest home you could have selected—and not even where you are can you expect to find as many hearts warm towards you as you found there. The move is made, however, and to mourn over it would be about as profitable as crying over spilt milk.

How do you spend your time? The spring, though coming on steadily and brightly, is still too far removed from summer to allow either you or me to sit under the shadow of trees, and even our rooms we must continue to keep well warmed. To be much out of doors is therefore impossible for both of us; and reading, especially with me—who have but one eye to trust to, and that getting more and more dense every day—is neither so amusing nor so profitable as it once was. It helps me, however, over some hours of the day, and prepares me regularly for bed after eleven has struck on the clock. I get my walk, likewise, though a silent one, turning my steps towards the woods, which are most enticing in their young green and rich in the melody of birds. Morning callers we have none, and I confess that I don't much regret it; yet there are one or two pleasant, because intelligent, neighbours within a circle of three or four miles, and these I am always glad to see. How are you dealt with in this respect? Our united love to Coe.

Ever my dear Harness,
Most truly and affectionately yours,
G. R. GLEIG.

THE END

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