THE ROYAL ENGINEERS JOURNAL.

Vol. XXIV. No. 2. AUGUST, 1916.

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Abbreviated Notes on MILITARY ENGINEERING.

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Sixth Impression just published. Corrected to 1st January, 1916.

Price 6d. per Copy, Cash with Order.

SECRETARY, R.E. INSTITUTE, CHATHAM.

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*LORD K.**

By VISCOUNT ESHER, G.C.B.

THE soul of a people resembles that of the supreme artist. Holbein and Gainsborough set before themselves a man's character, and perhaps exaggerate its peculiarities, although with extraordinary insight. The most famous portraits of statesmen and heroes delineate characteristics which the people have long since visualized after their own instinctive fashion. There is no divergence between the conclusions of the artist and those of the man in the street. What a great painter saw in the face of Scott, his contemporaries had already seen, and it is written in the book of the living for all time.

Long before the Northern seas engulfed him, his countrymen had declared their judgment about Lord K. In strength and integrity he had stood for twenty years upon a rock of popular confidence, among the shifting sands of parochial politics, and amid the threatening storms of international conflict. In him the Empire knew that it possessed a reserve force against the day of emergency or distress; and when that day dawned in unpreparedness and indecision, he vindicated the people's reliance upon his energy, and fulfilled their belief in his spirit of counsel and might. Detraction cannot harm him now, or envy obliterate his fame. For all time Lord K. is enshrined as the legendary figure of the Great War.

He shall be judged by what he was, and also by what he was not. Born in Ireland, but of English descent, his life had been lived in the wilderness and solitary places. The Orient had passed into his blood. The "call of the East," and its loneliness, fashion the devices of men's hearts; and they profoundly influenced his habits of thought and methods of action. His colleagues in the Government were astonished at both, and they often baffled his subordinates in the Army. To the politician and the bureaucrat he held a language they understood not. The Arabs had taught him to read the thoughts of others with weird facility, and in the desert he had learnt to conceal his own. Plain men were estranged by what seemed to them obnoxious tricks, and they charged him with deceit, when, with lack of insight, they found him inscrutable.

The aloofness of the desert places in which his youth had been spent was round about him in the Council Chamber. He refused to lay bare his inmost thoughts; and he sought to command, when he

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was expected to discuss. In argument he was a child before the thrusts of the keenly fashioned weapons wielded by his colleagues.

He would return from a long Cabinet, drop into a chair at York House, so weary and undone that further labour seemed impossible. Yet he would be found at the War Office after a short interval, grappling with the work he did so well, which a convention had interrupted. Once he complained to M. Briand of his inability to walk in the ways of politicians, his failure to provide them with plausible figures, or a well-adapted formula, and his lack of the art of parliamentary fence. M. Briand said to him, "You are the resultant of your upbringing, and your life environment. You have lived in lands where you could order a village to be pulled down here, or built up there, and where your word was law. But these methods are unadaptable to the Boulevard des Italiens."

Lord K. was conscious of his Orientalism, and many is the time that in intimate talk, posing as a dweller in a strange land, he has humorously taunted me with the habits of *my* country, and the idiosyncrasies of *my* countrymen. A statesman, an organizer, and an administrator he surely was, but he was not primarily a soldier. He negatived with clarity and decision the notion that he had trained his mind to statecraft by the study of history; or to war by the writings of Clausewitz.

At the Battle of the Atbara, a Staff Officer rode up to him, and on behalf of Sir Archibald Hunter asked for some tactical instructions. "Go back and tell him," said Lord K., "that it has taken me three years to bring him here to fight this battle, and that the issue is now in his hands, and not in mine."

An illustrious Frenchman said of Napoleon, "Il fut moins soldat que grand commerçant," and the phrase—questionable in reference to that myriad-minded portent—applies with signal fidelity to Lord K. Described as a mighty disorganizer by his critics, he possessed in reality all the highest attributes of a constructive administrator; a clear sense of objective, undivergent resolve, flexible methods, and patience. His views were long views, but in action he was quick; and wasting no time himself, he could not tolerate its waste by others. He was said to be ruthless in discarding broken implements, but I found him almost unduly sensitive to giving pain, even to those who served him badly, provided they did so to the best of their powers; and if one could accuse so strong a man of weakness, I should have called him feebly disinclined to lighten his own labours, when the achievement entailed hurting the feelings of others. For carelessness or neglect of duty he had no pity, but for incompetence he showed extraordinary compassion and unfailing good temper.

During the heavy flanking attacks delivered, not without justice, in view of a grave national danger, by the Northcliffe Press in 1915

upon his administration, Lord K. would make no scapegoat, and firmly refused to share blame, for which he took all the responsibility, with any of his subordinates. In public he covered every one with his authority, and in private he reproached no one but himself. These qualities bred confidence in those who served him, and inspired devotion in his friends and associates.

It has been said that he possessed few friends, but this is a travesty of the truth. If to be a companion of men, or a philanderer after women, is the superficial test of friendship and popularity, he enjoyed neither; but if quiet intercourse, right of access at all times, absence of reserve, shy but warm greeting, and an affectionate assumption of the right of service, are significant of true friendship, then Lord K. had intimate and faithful friends both among men and women. That he could inspire devotion in a heart fortified by knowledge and faith was exemplified in the "Fitz," whom he loved and trusted, whom we also trusted and loved, and from whom he was never parted, not even in death.

Lord K.'s towering personality and forceful character were apt to sweep men off their feet, but in later years, when age began to tell, his impressiveness varied according to his bodily vigour. When rested and unharassed, he seemed to the casual stranger to have in him the spirit of the holy gods. Often it was otherwise. Recently I had occasion, in the early morning, to hear him unfold his views on the political strategy of the war, as its prospects appeared to him. He was unwearied and fresh, and his mind played over the vast area of the war with a clearness of vision and a logical sequence that would have astonished those who had seen him in less incisive moods. I saw him again that same day, after a prolonged Cabinet sitting, and the virtue had gone out of him. He was as garrulous and inconsequent as any Front Bench politician.

There was an occasion many years ago when this variability affected his destiny. The Viceroyalty of India was under consideration. For administrative reasons that appealed strongly to the Secretary of State for India, objection was taken to the nomination of a soldier. King Edward had been anxious for the appointment of Lord K., and the recollection of our dead sovereign's wish carried great weight. The Secretary of State had never met Lord K. Circumstances had occurred that seemed to indicate to me as the means of bringing about a meeting. A dinner was arranged in a private room at the Savoy. Lord K. had that morning confided to me his keen desire to return to India as Viceroy, and his determination only to serve his country when he knew he could do so with all his powers, and could profit by his very special experience. India, Constantinople, and Cairo were designated by him as potential fields of action, but he expressed a strong preference for the Government of India.

That morning he was at his best, and would have converted Athanasius. Later that same day he was at his worst, in his anxiety to make a favourable impression. A curious shyness took the form of rash speech, that became his undoing. In a quarter of an hour he had disposed of any faint chance he may have had of overcoming a determination, based upon principles of life and government, that in the Secretary of State for India proved then, and notably since, to be inflexible.

If prophets go forth from the solitudes of the hills and of the desert, then it may have happened that gazing for so many years over the wide expanses of Egypt had given Lord K. a broader area of vision than is commonly found in street-bred statesmen ; but it certainly did happen that in those fateful days of August, 1914, he alone saw the duration and character of the war.

I remember well an occasion when a number of French officers introduced by General A. Huguet, one to whom England and especially France owe a debt of gratitude impossible to acquit, had just left him. They and the British General Staff were about to proceed oversea with the Expeditionary Force, and all were in high spirits. I happened to meet them outside Lord K.'s room, to which I had been summoned. They bade me farewell, but only for three or at the longest for six months. A few minutes later Lord K. was telling me what I have mentioned elsewhere, that he, on the other hand, took a very different view and was preparing for a long war, of not less than three year's duration.

"These French officers," he then added, "are convinced that the German main attack will come through the *trouée* where the French armies are massed and where they are well prepared. I do not agree with them, and have told them so. It appears to me almost certain that the enemy's advance through Belgium will prove to be their main attack."

This was the first occasion upon which Lord K. thought it necessary, in consequence of service he claimed from me, to speak plainly his views upon the progress and prospects of the war. It was followed by many others. His opinions, reflections, and forecasts, up to the final parting before I came to France a month ago, were carefully recorded. He dealt freely and openly with every phase of the political and strategical problem, on the Western and Eastern Fronts, and it will surprise those who have questioned his capacity and doubted his judgment to read some day the story of his prescience. When he changed his views he was the first to make the admission. His words, hampered by inexperience and shyness in the presence of critics, came easily and tersely to the rescue of his thoughts in private intercourse.

That Lord K. was at his worst in counsel may be readily conceded. Had, however, our institutions permitted the sole responsibility for

the conduct of the war to be placed upon his shoulders, had he been compelled to deal alone with the diplomatic Balkan problems, as he dealt with Fashoda, had the organizing of victory been left absolutely in his hands in this great war, as it was in the Soudan and South Africa—the face of Europe would have presented a very different aspect to-day. At such critical dates as January of last year, 1915, he would—if acting alone—have taken decisions that would have changed the fortunes of the war, and led far sooner to its close. His imperious temperament induced him to prefer his own plans to those of others. I had occasion to make many suggestions to him, and I never recollect his adopting any one of them.

Especially interested in the Territorial Force, I urged him to build upon that foundation his new armies. A questionable vanity leads me to the conclusion, even to-day, that he might well have done so. I am certain that a more commonplace Secretary of State would have yielded to the reasons that were urged at the time. It was the sound official view, and under sound official administration we might have raised a million men by such unexceptionable machinery. Lord K. had vaster designs, and felt that to give effect to them he required the stimulus of new methods, and a fresh machine. He employed both, with stupendous results visible in the great Imperial Armies now assembled in France and elsewhere. It was not the first, but the last million of British soldiers he could raise that were ever present in his mind.

In 1911, many secret documents were composed, and many military publicists took pains to prove, beyond all reasonable doubt, that in a war between France and Germany the decisive battles would be fought within the first fortnight of the outbreak of hostilities, and that the presence of our six Divisions in the field at the crucial point, and at the earliest possible moment, was the essential element of success.

In the autumn of that year, Lord K. scouted this notion as puerile, and wrote to me, what he repeated with emphasis in 1914, that the war would be ended and victory achieved by the "last million" of men that Great Britain could throw into the scale. This was his solvent for the desperate problem with which Europe was faced. Until he saw his objective within reach, and the armies of which he dreamed materializing all over the Empire, his days were harassed and his nights sleepless. No man felt so persistently and so acutely the high pressure of the war as Lord K. In his house at Broome and in the long evenings at York House, this preoccupation never left him, although he tried to divert his thoughts into other channels. Invariably he returned to the one engrossing topic of how to defeat our enemies in the shortest possible time. The faithful Fitz—indeed everyone admitted to his intimacy—tried to give his strenuous mind some relaxation. It was a fruitless task, and as the cold Northern

waters closed over him, I am certain that his last prayer to Almighty God was for the Armies he loved, and the victory he had so ardently desired.

At a gathering of the Allies, among the French statesmen and soldiers at the Grand Quartier Général, among his colleagues at a war council or in any sort of company, Lord K.'s personality was dominant. Stature, both of body and soul, was his main characteristic. Politicians and some soldiers said of him, this man is not "clever"; he is unimpressive in his judgments; and mightily inarticulate in momentous discussion. Nevertheless, he stood a cubit higher in the eyes of the people than any of his contemporaries. *Securus judicat orbis terrarum.* There we may leave him.

He had much prejudice to contend against on the part of many who, although they feared him, resented his strong personality, and his ignorance of English political methods. He showed no resentment, and bore no malice. Much contemptuous and unjust criticism of his acts and ways came to his ears. Attempts were frequently made to exasperate him against his critics with a view to injure them and their professional or political prospects. These attempts invariably failed. But he felt deeply the want of loyalty, and above all the lack of friendly regard on the part of those with whom he laboured and associated.

I can see him standing with bowed head, with his back to the fire, in his bedroom at the British Embassy in Paris. In three hours he was to leave for Egypt and Gallipoli. His return to England, he had said a very few moments before, was very problematic.

The task of having to evacuate Gallipoli he dreaded and disliked with all the intensity of a nature accustomed to vanquish obstacles and to achieve success. He could, he said, perceive no ray of light. He spoke of those who had seen him leave England without regret, and very solemnly he added words that if quoted could only give rise to feelings of remorse in those of whom he spoke gently and regretfully. When he raised his head his eyes were full of tears. Fitz and I, who were present, were struck speechless. Here in France Lord K.'s great qualities were valued, and his value recognized. In the eyes of the French Armies and the French nation, he stood for England. His death and the manner of it have vibrated through this land. It is known here and appreciated, that on the very day when the fatal news was received, another Division of the Armies that bore his name had begun to land on the soil of France.

"He was a fine character, lovable, and straight—really," is the simple phrase in which a great soldier sums up the leader under whom he had served. No other epitaph is required for the man. As for his achievement, many waters cannot quench it, nor can the floods drown his fame.

ESHER.

France, 1916.

*EARL KITCHENER OF KHARTOUM.**

By CHARLES WHIBLEY.

IT is the paradox of Lord Kitchener's career that, though he had spent but a few brief years in England, he was better known from one end of Great Britain to the other than any other Englishman of his time. He possessed in a high measure the true qualities of an Englishman. He was curt in speech and firm in action. He went about his business always with a clear perception of the end at which he aimed. It was his habit to dominate events, not to wait blindly upon hazard. When he made his famous advance upon Khartoum, for instance, he had planned every detail of march and victory before he set out upon the road. He understood perfectly that battles are not won by will or by accident, that troops must first be trained and railways laid; and he proved how much British zeal and British foresight might accomplish in a country where our armies had too often been left to be the mere sport of chance.

It was, then, the qualities of the gravely practical man that endeared Lord Kitchener to the English people, which saw in him precisely the virtues which it would, if it could, always possess itself. And there is another reason why Lord Kitchener should have won the sympathy of every unit in the unimpassioned democracy. He was one who took up more space than his fellows. He had that rare faculty of displacement, which only the great ones of the earth may boast. He could not escape notice as he passed from York House to the War Office. His presence in a room was instantly felt. He had not the tricks nor the graces of the orator, and yet the plainest statement which he read, sometimes painfully, in the House of Lords, carried with it all the weight which belongs to sincerity of mind and simplicity of purpose. Indeed, the mere fact that he spoke not as a politician but as a soldier vastly enhanced his fame, and we may find a certain consolation in the trust which the people reposed in him. After all, the great prize of life, the confidence of millions of men, is not given only to the professors of a showy rhetoric.

In one other respect Lord Kitchener showed himself an Englishman of the true breed. He depended less upon balanced judgment than upon quick instinct. To discover the course which he ought to follow was with him a process of feeling, not of thought. Where a

* Reproduced from *Blackwood's Magazine*, No. MCCIX., July, 1916, by kind permission of the author, and of Messrs. Wm. Blackwood & Sons.

smaller man would find you a hundred reasons why he should do this or should not do that, Lord Kitchener went straight to the point, as though he had omitted all the steps which generally separate a design from its fulfilment. And he added to this instinct of action a wide grasp of detail. When he had made up his mind, he could not always explain why he had made it up in that particular direction. But he saw instantly all the means which were necessary to fulfil his purpose, and he neglected none of them. In other words, he was swift in resolution, deliberate in action, and upon this happy combination of qualities the success of his career was built.

That he should have won the confidence and affection of all classes, that his death was mourned with a grief which few among the sons of men inspire, were the just reward of a life given wholly to the public service. Ever since he received his commission, in 1871, Kitchener had devoted himself with a whole heart to the welfare of England. The first years of his activity were spent in surveys of Palestine and Cyprus—of great value in themselves and of importance to Kitchener, because they laid the foundation of that familiarity with the East and with Eastern modes of thought which afterwards stood him in good stead. From the year 1882 onwards he played his part gallantly in the drama of Egypt, and began the fight with Mahdism which was finished only at the taking of Khartoum. He crossed swords more than once with Osman Digna; and in 1892, ten years after he had entered the service of the Khedive, he succeeded Sir Francis Grenfell as Sirdar.

In 1896 Kitchener undertook that which perhaps remains his greatest achievement—the conquest of the Sudan. His victories at Dongola, Atbara, and Khartoum have passed into the proud inheritance of our race. And these victories were won not by a series of brilliant dashes into the desert, but by months of sedulous toil and perfect organization. Here for the first time Kitchener proved his mastery of all the details which further the progress of a campaign. And whatever was done was done by the man himself. He had trained his soldiers, he had arranged his commissariat, he had seen the railway justly and truly laid. The advance upon Omdurman was a triumph of military skill and courage, and the battle which preceded its fall avenged the death of Gordon and made us masters of the Sudan. Nor did Kitchener fail his country when at Fashoda he was confronted by Colonel Marchand and his expedition. He turned lightly from warfare to diplomacy, and by his tact converted what might have been a delicate situation to the advantage of England.

The rewards which his gallantry and prudence had earned and deserved were lavished upon him. He was raised to the peerage, and received with a grant the thanks of Parliament. Better still, he was given an instant opportunity to justify anew the confidence

of the country. When Lord Roberts was sent to South Africa, Kitchener accompanied him as Chief of Staff, and served his Commander-in-Chief with a loyalty and self-suppression which are not always found in one who for years had enjoyed an independent command. Upon Kitchener fell the heavy duty of suppressing the guerilla warfare of the Boers. He pursued his adversaries relentlessly; he swept the country from end to end with military vigilance; he invented the system of blockhouses which at last ensured the victory of the British arms; and he showed his wisdom and clemency when the right moment came by offering terms which were by no means dishonouring to a valiant foe.

Again his sojourn at home was cut short. Scarcely had he set foot in England after the Boer War than he was sent to India as Commander-in-Chief. The work which he did in reorganising the Indian Army, in the building of strategic railways, in making yet more solid the defences of the Indian Empire, is known and appreciated by us all. Seven full years he spent in India, and in 1911 he was appointed British Agent and Consul-General in Egypt. He went thither in troublous times. Sir Eldon Gorst, at the instigation of Sir Edward Grey, had been attempting to introduce the doctrines of Tom Paine into Egypt. It was not his fault that he failed. He was but carrying out the designs of the Government at home, and, as he said himself, of the British People. Now the Government at home consisted of pedants, who pretended to believe that democracy was a cure for all the evils of mankind; and the British People, which did not know where Egypt was, cannot be accounted a good judge of what was needed for the pacification of a strange, unfamiliar land. Had Sir Eldon Gorst been wisely guided, he would have resigned rather than attempt to force representative institutions upon a country, of whose 11,000,000 inhabitants only 600,000 could read and write. His was the mortification of seeing disorder and discontent overwhelm the people which it was his duty to govern. And when Lord Kitchener succeeded him there was work to do which only a strong man could accomplish successfully. After two years of resolute government, Lord Kitchener had the satisfaction of restoring to Egypt law, order, and prosperity, and of bettering vastly the lot of the Fellaheen.

In 1914, by a fortunate accident, for which we shall ever be grateful, Lord Kitchener was in England. There was an imminent danger at the outset of the war that Lord Haldane should return to the War Office, and that England should be satisfied with exerting her supremacy at sea. The country clamoured for Lord Kitchener, who, already on his way to Egypt, was hastily recalled. Then began his reign at the War Office, which turned England into a military nation and enabled us to throw large armies into the field. The difficulties which lay in Lord Kitchener's way would have

daunted a less intrepid spirit. An office arranged to administer a small army had to be transformed to an organization capable of equipping, training, and supplying millions of men. And a yet greater obstacle was thrown in Lord Kitchener's path. He knew little of England, and nothing whatever of English politicians. He had spent all the working years of his life in the East, where a man may do his duty without measuring the pressure of this or that colleague, without being asked to oppose the intrigues of men who should have given him willingly all the aid that he asked. Hard as the task was, Lord Kitchener faced it with equanimity and success. He baffled the politicians. He enrolled his armies at home, and he stood abroad for the symbol of British courage and British resolution. All that we owe to him we shall know only when in the fulness of time the history of the war is written. Meanwhile we may gratefully acknowledge two immense services, among many others, which he did to England. At the time when foolish optimists were loudly declaring that a victorious peace would come within a few months, he deliberately and firmly prepared for a long fight. "Three years or the duration of the war"—the phrase was heard on all sides, and was a public guarantee that Lord Kitchener at least did not underrate the heavy work that lay ahead of us. And then the magic of his name attracted thousands to the colours. He achieved what might have seemed impossible. He raised an army of millions where no army was, and he inspired the British nation with the valour to fight, and the hopeful assurance that victory would be theirs. This Lord Kitchener did, and none other than Lord Kitchener could have done it. It was a favourite saying of his that "the work matters, not the workman." And with this thought in his mind he died, we are sure, serene and contented. The workman had done his work, and the work will endure, even though the tireless soul that did it lies fathoms deep in the North Sea.

THE JUNCTION OF THE INDIAN AND RUSSIAN TRIANGULATION WORK IN THE PAMIRS.

(Continued).

THE TRIANGULATION ON THE TAGHDUMBASH PAMIR TO THE RUSSIAN STATIONS.

By LIEUT. (NOW CAPTAIN) K. MASON, R.E., *Assistant Superintendent, Survey of India.*

A word is necessary on the subject of the country over which the triangulation had to be carried and on the climate. Colonel Tcheikine, of the Russian Triangulation, had completed his work in 1912, finishing up on two stations, one on either side of the Beyik Pass on the Russo-Chinese border. Reconnaissance was carried out in 1912, which showed that it would be impossible to utilize either the Kilik or Mintaka routes for connection to the Indian work, and anyone who has been along these "roads" will readily understand the reason of this. It is extremely difficult to get out of the Upper Hunza gorge, owing to the precipitous nature of its walls; and it was therefore hoped to take the series up the Chapursān and connect across country at the head of the Derdi and Hark Nalas; the only alternative to this was a system of very small triangles along the bed of the Hunza River, which would have accumulated a large error.

The general idea taught at school is that the Pamirs are a tableland. But anything more unlike a tableland, which seems to imply something level, could not be imagined. I have tried to bring into line the general idea with the actuality, and if one is to call the Pamirs a plateau or tableland, one may liken them to a table with a rough cloth over which the gods amuse themselves by playing "blowing the feather" from one end of the table to the other. The cloth becomes crumpled and torn, the wind cold, and the unfortunate human feather leads a most unenviable existence.

Lord Curzon estimates that the plains or valley portion of the Pamirs constitute less than one-tenth of the whole mass.*

However this may be, triangulation on the Pamirs cannot be considered uncommonly difficult, provided the detachment remains healthy. This is the whole crux of the matter. The mountains are generally high, the summits of those suitable for survey stations averaging somewhere between 17,000 ft. and 19,000 ft. Their ascents

* *Geog. Journal*, Vol. VIII., 1896.

are not difficult when once the observer comes to look on laid snow as a friend and not a foe. Handholds are rarely required, and in my opinion there is much more pleasure to be derived from climbing in June on snow than later in the season when the slates and shales are exposed and make the going very tiring. Many of the detachment who did not care for the snow at first would have given anything for a hard snow climb later in the year. Provided one can keep warm and fit, get enough to eat, and has luck with the weather, the rest is more or less plain sailing. Above all else, the necessity of sufficient and suitable food is overwhelming; it keeps one warm, healthy and cheerful, and stores up the essential energy. It is easy to keep warm, even without fires, though I am told that it freezes every night on the Taghdumbash. We never indulged in fires or stoves, as fuel was scarce and only consisted of yak-dung, and a sufficiency of warm clothing was a far better substitute. But the food question was a more difficult one to solve, with our limited experience.

The Pamir detachment consisted of Hingston and myself, 10 Gurkhas, about the same number of servants, orderlies, native guides and interpreters, and some 70 or 80 permanent coolies. To keep roughly 100 men rationed in a country that only produced milk was a constant source of anxiety. We bought *ata* from Hunza territory and more was promised later. Once on the Pamirs we wrote to and had a promise from the Amban of Tashkurghān for any amount of *ata* up to 8,000 lbs., but owing to failure on the Hunza side and the arrival of Chinese troops at Tashkurghān, we were for a time reduced to half rations. I had then to dismiss some coolies and this cramped our action to a certain extent, necessitating lighter and more uncomfortable camps, with their attendant consequences. The signallers were each supplied with a mate for cooking purposes and two coolies for collecting yak-dung for fuel, etc.; this was a minimum for them. The main lesson learnt from the work in 1912 was the futility of trying to carry on in these parts with insufficient men.

The ration for all men was 2 lbs. of *ata* per day, and they could sometimes supplement this with sour curds and milk, an occasional sheep, goat, ibex or *poli*. While this ration could be maintained, there was never any sickness, except in the case of one khalassie who suffered from mountain sickness the whole time and had to be left in the depôt camp at Mintaka Akhsai; besides this there were a few cases of local mountain sickness amongst the men. It was noticeable that one district was far worse than the rest in this respect; this was Kilik East h.s., which was particularly bad just before the beginning of a week of very vile weather. I think everyone was distressed when breathing on this occasion, even the Sarikōli interpreter with us, and a Sarikōli dog was actually sick.

Whether this was "regional" or "seasonal" sickness, I cannot

say; possibly the latter, as on two later ascents of the same station the distress was not so great. One of the party quite lost his appetite towards the end of the season, but this may have been due to the unappetising nature of the fuel, which though serviceable when dry, caused an unpleasant odour and *taste* to pervade cooked food during bad spells of weather.

The signals used were, in nearly all cases, helios, and I should here like to pay a tribute to the signallers and khalassies, who had a very hard time of it on the whole, and suffered much discomfort.

The Pamir detachment began work on June 4th, the day after our arrival on the Taghdumbash. Helio men were sent out to Dastur and Lup Gaz, and a reconnaissance was made from Mintaka Akhsai h.s. Helio communication was established with Dastur, but the men sent to Lup Gaz failed to reach the summit owing to soft snow, and a reserve party, quickly put through their paces by Naik Bulnar Sing, 9th Gurkhas, was sent in their place, and ordered up the next day. On the 5th, we marched to below Takhtakhūn and on the following day took a light camp halfway up the hill and camped at about 16,000 ft.* The route led up a left bank tributary of the Karachukor and was quite easy. On the 7th, sending our light camp down with orders to pick up the base camp on the Karachukor and march round *viâ* the Chinese post of Beyik to a point in the valley of that name east of Takhtakhūn h.s., we ascended the latter, and found Bell's signal and mark intact. The tent signal had fallen slightly over to one side, and was partly buried under snow. We had only intended to reconnoitre from here on this occasion, but the climb had taken us less time than we had expected. The route led up a steep snow couloir to some gendarmes and then followed the ridge for about a mile, and the early start made the way quite easy. The day was brilliant, and we were able to do some observations, while Hingston carried on the photographic survey. Abdulla meanwhile reconnoitred for a way down into the Beyik Valley, but as it was getting late when we left the station, and his route was on snow with a tendency to avalanche, we selected a better route later in the day. The triangulated height of Takhtakhūn is 17,595 ft.

On the 8th, two Cossacks visited our camp and after inaugurating a new *entente cordiale*, with not a little success, we marched to below Sarblock h.s., the Russian East station, and made our plans for the next day. One signaller had been despatched to Tongder h.s., with orders to expect a call on the 9th, and after a very early start owing to the presence of a large number of ibex in the neighbourhood, one of which was bagged, we ascended Sarblock, height 17,284 ft., and

* The mean of two aneroids gave 16,350, but varied so much on different ascents, that the heights by this means are unreliable.

found the Russian signal and Bell's mark intact. The station was an easy one to climb, but unfortunately the day was none too fine and towards evening slight snow fell. For a time, however, we had a fine view of the Russian Pamirs and of the Sarikōl Range, the latter trending away northwards. I think that the summit of Mustagh Ata, "the Father of Ice Mountains," 24,388 ft. in height, might have been visible from here if the view in this direction had not been spoilt by the heavy clouds. The Russians used an opaque signal and as such it was a very good one. Four inclined poles met above the mark, and at their junction there was a fifth and vertical one carrying the remains of a flag. This admits of a theodolite being placed over the mark and under the signal without disturbing the latter. A similar mark was observed on Kukhtek (Russian West) h.s. (height 17,031 ft.), the observations from which were completed in 1912 by Bell. The signaller who had been sent to Tongder signalled to us from a spur that he had been unable to reach the summit of the station, so we had to make up our minds to follow him on the 10th.

At this time our camp contained a curious variety of races and religions. Besides the Cossacks and their Chinese servants, there were men from Hunza, Baltis, Gilgitis, Kashmiri Mahommedans and Hindus, Sarikōli Tajiks, Gurkhas, one Englishman, one Irishman, and a down-country Mahommedan cook. On only one occasion did I ever notice the slightest unfriendliness between any two men of different races, and this was between a Hunzakūt and a Sarikōli headman who had given him an order. With this one exception which was quickly settled, the most cordial relations existed in the whole camp.

The Survey detachment had now been in the three biggest empires of the world, the most complex, the most ancient, and the most autocratic. After a journey lasting exactly two months since the day of leaving Dehra Dun, we had reached the Russian stations, and were ready to begin observing on the way back. Everything seemed to promise well; there had been no sickness, it seemed as though we had nothing to worry about as regards food; the Sarikōlis were most friendly and hospitable, and the weather had given us the most promising indications.

On the 10th, however, we awoke after a dismal windy night to find the whole place a dreary white wilderness of snow, and snow was still falling with a silent steady monotony that gave us the impression of a glimpse into eternity. With scarcely a break, this continued throughout the 11th and 12th, but an apology for a clearance occurred on the 13th, and we were able to move camp a few miles to the mouth of the Tongder Jilga. But snow came down on us again about midday, and we were forced to pitch camp.

On the next day we left camp at 5 a.m., and went up Tongder

h.s. (17,611 ft.). The going was not difficult; in fact we did not have a piece of really interesting climbing the whole season; but the snow was new and soft, so that we sank in places up to our thighs. Even so I think we were better off on this occasion than we should have been later in the season, when the route would have been either on loose rocks or shale. I observed to a few intersected points, as Bell had completed the stations the previous year, but the weather was vile, and snow constantly fell at intervals. The wind was also very strong and I used the observatory tent. I afterwards gave this up as I found much time was wasted by not having the right window open when wanted. It was more unpleasant without it, but I do not think the observations suffered, and when in a tent in a high wind I was always in a mortal terror that the tent would be carried away. On this occasion as on several occasions later, the ink froze, so that we had to record in pencil. We took the signaller up with us, but he suffered from slight mountain sickness, as did one other of the Gurkhas. About 12.30, we decided to return, and we had a great "joy ride" on the snow on the way down. The snow was in excellent condition for a plunging glissade, and of just the right consistency to make the pace exhilarating.

Having deposited our signaller in a low camp about 15,000 ft., we marched in the gloom of another snowstorm down the Beyik, to below Takhtakhūn h.s. *En route* we received reports from our signallers of the joys of the camps at high altitudes, but could do no more than rave against the fates, the gods, and the weather. On the 16th, it really seemed that our curses had had some effect and we started off for Takhtakhūn, but only made some 2,000 ft. before the snow came down again. The next day we were away before 5 a.m. hoping against hope the weather would change for the better, but on reaching the summit, it turned as bad as ever, so we pitched our 16-lb. Whymper tent, packed a few people in another, and sent the rest down. Towards evening, we were able to get some observations completed as the weather cleared and one sportsman in the 9th Gurkhas had returned as soon as it was possible.

". . . The delighted spirit
To bathe in fiery floods, or to reside
In thrilling regions of thick-ribbed ice."

We then dined off ram-chukors' eggs, a rare occurrence and one which, incidentally, we regretted afterwards, as we did not come across any more. As we had had a message that the helio men had been unable to find the Tomtek mark we decided not to wait, but to push on and return when we were certain that this station was correct, and in the meanwhile we sent our Sarikōli interpreter, Arzu, an excellent man in every way, to help the helio squad. Early on the 18th, we sent word down to our low camp for a double march

up the Karachukor to Kuss Kussu, and ourselves marched there, arriving at nightfall below our next Survey station, Dastur. Our bedding did not turn up, so we slept in hope and our clothes.

The 19th deserves a new paragraph, for it was cloudless throughout. We were, however, a little late in getting off, because the march on the 18th had been rather too severe on the coolies, but we reached the station of Dastur by 2.30 p.m., and called up most of the stations, the Gurkhas turning out of their tents, like marmots after winter. The Lup Gaz helio did not show, so we had to return on the 20th, when we had more luck and were able to finish off the work. The return journey, which afforded a pleasant glissade for nearly 3,000 ft. was accomplished in about half an hour. On the 21st we took a light camp up Mintaka Akhsai h.s., completed about half the observations, and the next day finished off and came down to our depôt, where we had a wash and brush up, which we were sorely in need of. Perhaps it is nothing to be proud of, and not quite the thing in civilized countries, but it is a fact that we rarely undressed for the night, had a bath, or were able to change our clothes. It was either too cold or we had no time. In this we more or less followed the prevalent custom of the country. But as regards washing our faces there was no skin to wash, for the snow and wind were already playing havoc with the raw flesh beneath.

After a short march on the previous day, on the 24th we left camp at 5.30 and, taking a light camp, went up Tomtek; we completed all the observations to those stations on which helios had been placed, were able to send the camp back again, and follow in the evening. This was our highest station up to date, 18,608 ft., and it was very tiring keeping on one's feet for five hours on end after a somewhat strenuous climb.

Tomtek is one of the highest mountains in this part of the Pamir and everything appeared spread like a carpet crumpled beneath us. It was indeed a magnificent sight and the mountains we had already been up seemed almost insignificant. The station mark-stone was let into the ice cap, which we eventually found to be a cornice.

From here we saw a literal waste of mountains, which for ever rooted out any idea of a tableland that may have been lurking anywhere in our thoughts before. In every direction there was the same interminable range upon range, the same stupendous desolation, planned without any apparent form or thought. It was the Earth of B.C. 4004, and a sight to stagger the imagination. The three greatest Empires of the world lay at our feet, and whichever way we looked, they appeared desolate, uninhabited, and uninhabitable, a seeming maze, as though Nature had tired of method and cast the surplus of the earth's crust down here, hoping that no one would find her out.

On the 25th we divided the detachment, and while Hingston kept

on with the photography, I doubled back with a squad to Takhtakhūn h.s., and owing to a very early start on the 26th, we finished the work to Tomtek and Dastur, and on the following day returned to our depôt. While on Takhtakhūn h.s. on this occasion, a khalassie, while building the cairn, dropped a boulder on my knee and lamed me for a day or two.

We now intended to take a rest, as we had been up four stations in eight days, often with long marches between, and while at Mintaka we had an opportunity of observing our surroundings more closely, and I extract the following note from the doctor's journal:—

"The fat-tailed sheep which the nomads tend are interesting. In the winter, when food is scarce, the fat in the tail disappears, and in the summer accumulates to such an extent as to form a large rounded mass projecting from the hinder extremity of the animal. Thus does Nature convert that mysterious animal appendage—the tail—into a storehouse for food, which in time of need, the creature can burn up and use for fuel in its economy. The shearing season has just passed and most of the sheep are bare of their wool, with the exception in many cases of a large area over the buttocks, which has not been deprived of its natural covering. I was unable to understand clearly why that portion of the animal had not been shorn. The animal's great enemy seems to be the wild dog, which is also said to cause much havoc amongst the *ovis poli*. The Sarikōli uses the domesticated dog for protecting their flocks against its wild congener."

We had a little trouble with one yak owner on this day. Most of these people have a very poor idea of the value of money. They can get very little in Tashkurghān, and so, when one pays for anything in cash, one has to realize that to be a fair exchange, one must pay for time wasted in getting things the ten marches from Kashgar. Bell realized this, and produced a wonderfully fair rate for everything he or any of his men might want, and himself insisted on these rates being paid. The rate for yak transport is well known—one rupee per day for any march whether for half a mile or 30 miles. This is quite fair, because a yak needs no tending when halting, and he will go apparently all day without worrying. Bell also used to pay the same rate for a milking yak. One beg, Kumalik, however, had a very fair idea of the value of ready money, and besides being quite incapable of counting above ten, he could see no reason why we should not pay a rupee a day for a milking yak and a rupee *for each of her two calves*, though the latter were actually fattening on our milk. We eventually gained our point, but during the negotiations, he had been rechristened "Bukhwassie Beg"—the bukhstick. I was afterwards told by a Sarikōli that the name had stuck to him and would remain with him till his dying day.

On the afternoon of this day the camp presented quite a gala

appearance, all the Gurkhas getting hold of Sarikōli wedding garments (mostly feminine attire) and coming to us to be photographed. The kit may be described aptly by the word "loud," but detailed description is quite out of the question.

On the 29th, we had intended to move camp, but early in the morning a Chinese officer came to call on us, having as he told us lost his camp. So we remained one more day to entertain him. Yung Chung Lun was still in possession of his pigtail and quaint kit with his absurd little straw hat, but the Republican *hukm* had arrived and he told us that pigtail and kit had all to be changed within the month. He rather liked our brandy, and we toasted a new entente to "*Askola.*" Conversation was carried on through two interpreters—through the medium of Turki. After tiffin, when the fact that he had had enough was made known to us by the expressive remark that his head was going "*hulla-pulla*," we found that it was nearly tea time.

We had arranged to meet McInnes about the 1st on the Kilik Pass, so on the 30th, we marched to Taghramansu, westwards up the Pamir, and on the following day reached the Kilik Pass, after a halt in Tulboy's hospitable khourgas, where after much *kow-towing* and *askolas* we bade adieu to Yung Chung Lun, who asked us to stay with him at Tashkurghān. On the way we had an interesting experience in the shape of hunting. Arzu's dog entertained us by stalking and killing a marmot, much to the admiration of my dog Smiler, an optimistic enthusiast, but one who had no idea of hunting for his own food. At the top of the pass we heard that McInnes was in camp at Bun-i-kotal, and sent word to him to meet us on the pass the next day. His chief trouble was the link between the Chapursān and the Kilik, and I believe he had by far the most difficult country. His climbs were worthy of the name, and he was near enough to the Pamirs to get most of the bad weather. He looked thoroughly worn out and from now onwards his health caused us all an extra anxiety. But he stuck to it like a Trojan, and was the last to finish work.

Our food question was now beginning to cause us some fears, as the promised convoy from Hunza was a fortnight overdue and all the men were on half rations; we fell back on the Amban's promise, but as bad luck would have it, a regiment of Chinese troops had arrived in Tashkurghān and commandeered all supplies. The local begs then came to the rescue and supplemented the small ration with "*lassi*," or sour curds, and I can never be grateful enough to them for all the help they gave me during this time. At the same time I had to reduce my squad and send some men back.

It was bitterly cold on the pass and I believe the wind is always the limit here. It defies description. Heavy dark ominous snow clouds were gathering towards evening, and on the 3rd July after

ascending the new station of Kilik East (height 18,203 ft.), we commenced to clear the cornice away; we soon found this was too much of a task, and would have taken us days; so we had to build a large platform from which we could see over the cornice to the north.

Our camp was not with us so we came down some 2,000 ft. for the night. The following morning it was distinctly dismal when we woke up. The country had again become a vast white desolation, and snow was silently falling. Dark threatening clouds loaded with misery rolled overhead, and we remained in our sleeping bags all day.

On the 5th, we again went up Kilik East h.s. The new snow had completely changed the aspect of the country, but the day seemed as though it intended to be more obliging. It was weary work ploughing through the freshly-fallen snow, and when we reached the summit, and set up the observatory tent, the weather had again changed for the worse, and we had nothing to do but crawl back into our sleeping bags, and listen to the *thud-thud* of the snow outside. We were immensely cheered towards evening by the arrival of news that the Hunza *ata* was only two marches off, and it seemed to give us a new hope. The next day was the same monotony redeemed by one faint glimmer of a sun. Twice we left our sleeping bags and cleared away the snow from the observatory tent, and set up the theodolite. But almost at once we had to pack up and crawl disconsolately back into comparative comfort. A coolie, one of the best, arrived in the evening through the blizzard, and found his way to our high camp on the top of the hill with a dâk, the most welcome we had ever received. But there was bad news. McInnes and Collins were having greater trouble than they had expected, owing to a fault in the reconnaissance, and I was asked to observe from the two Kilik stations to the south. This meant that I should anyhow have to revisit Kilik East h.s., so there was little further use in my remaining on the station now, and on the 7th, after again experiencing the same snowy weather, we decided to leave and complete the work on the Pamirs itself. Desolate as the pass seemed under its white pall of snow, it seemed a veritable paradise after the discomforts of the last few days, but we did not linger, and made our way to Tulboy's *khourgas*, where we were the recipients of his generous hospitality. We exchanged presents, and then had our first bath for over a week.

In the morning the weather was brilliant, and we marched to the Jalung Jilga, and on the following day ascended the hill station of that name (17,510 ft.). It was a perfect day, and all the lights showed except one. This we afterwards found was due to both the signaller and his mate being temporarily unwell, and luckily we did not wait. We came down the same day, and followed with an evening march to a spot below our next station, Karakokti (17,708 ft.).

On the 10th, we went up this station in fine weather, observed to all stations and points, and returned to our low camp.

On waking up the following morning, I found I was snow blind, as was Kulbir, of the 5th Gurkhas. Observing in a snowy land is rather hard on the eyes, and from now onwards till the end of the season my eyes gave me trouble, particularly after a long day's observations. On this occasion I made someone lead my yak to our next camp below Tomtek, from which station we were now going to observe to the forward stations. We met Blandy on the way, who gave us an account of his shooting luck, and he camped with us for the night. He had examined many of the minor valleys in search of *ovis poli*, and had secured some of the best heads in the district. In addition he was able to add to our scanty knowledge of some of the outlying parts of this Pamir. My recorder, Pandit Aftab Bhan, had an accident during this march and was put *hors de combat* for a month, and Hingston very kindly offered to undertake the duties instead. I can never be sufficiently grateful to him for this, and undoubtedly he saved me by this means a large amount of trouble.

We had a great day on the 12th. At the first streak of dawn we did a long trek up Tomtek. There was less of the winter snow than on our former visit, and the new snow had cleared away by now. Again we had the perfect view from the top. Somehow one felt that this one view was worth any amount of discomfort. My eyes were causing a good deal of trouble, and owing to the constant rests that I had to take from this cause, observations were very slow. But all the lights were showing up well and we were lucky in getting the work completed; we were thus able to return to our low camp the same day, arriving just before dark, after a glorious and exhilarating "breeches glissade" for some 3,000 ft. We collected a good many specimens of the flora on our way back to camp, for the side valleys were by now enjoying their spring, and, comparatively speaking, the land near the waters of a tributary stream was really almost fertile.

On the 13th we marched to Lup Gaz Jilga, halting *en route* at our depôt for lunch. We camped on the spot where Harry Bell had died almost exactly a year ago. Harry had endeared himself to all these people during his stay on the Pamirs; Arzu told me he had never met anyone who had set such a high example. He refused to contemplate that he was near death, and when McInnes arrived after a long day's ride, Harry had told him to go and get some rest. This was the brave spirit that could think of others, when at death's door, and the impression that this act had on the people was only equalled by the calm resignation with which he faced the end alone. Those who knew Harry best, knew his sterling worth and his splendid qualities, and to some extent can gauge the loss. But it needs a visit to the lonely spot where he died, to get a glimpse of what his

thoughts must have been, and get a true answer to "cui bono." A man more unselfish and unconcerned for his own estate, it would be hard to find, and a more conscientious observer is an impossibility. In a letter Colonel Tcheikine wrote to me from Tashkent, he said "Quant à moi, je suis fort heureux d'avoir pris part au travail universel, avec nos amis les Anglais, mais mon bonheur fut assombri par la mort soudaine du jeune, intelligent et sympathique compagnon de travail, que fut Monsieur le Lieutenant Bell."

At Lup Gaz we built a large cairn to his memory, with a suitable inscription cut in granite, the work of some hours. It is not often perhaps that Mahommedans will apply for permission to build a shrine to the memory of a Christian, but it was so in this case, and I found that the Sarikōlis already knew this valley as the "Bell-Sahib-i-Jilga." His example will remain in the memories of hese people for many years to come.

We completed the observations from Lup Gaz, 17,695 ft., on the 14th, and on the next day did a short march to our depôt. It snowed slightly during the day, but nothing to speak of. We had found that the helio men on Lup Gaz had been unwell and we had left a squad to relieve them; so now that we were certain of a light there we returned to below Jalung Jilga h.s. and camped in the Kara Jilga. On the 17th after sending our camp on to Kukturuk, we climbed the station by a ghastly route on shale, finished the observations and followed on yaks to our camp below Kukturuk h.s., arriving about nightfall.

My eyes were rather strained again, but we finished Kukturuk off the next day, being able to ride yaks up the greater part of this, one of our lowest stations. We had been expecting a dâk for nearly three weeks now, and since the bad news from Collins and McInnes on the 6th we had heard nothing, and were getting anxious; a helio message came in from the signallers on Kilik East that they had been watching to the south for some days and had seen no flash from McInnes' helios. I was suffering from an attack of rheumatism, so we decided to remain here for two or three days. Five stations had been ascended and observed from in ten days, which of course had meant very early starts, and late arrivals into camp of an evening. There was always heaps to be done in the evening after dinner, developing the survey photographs, checking means, and writing up a duplicate angle book and notes of the day's work. Hingston generally had in addition to helping me with this, his birds to classify, the flowers to press, and on colder nights, a good deal to say on such subjects as Home Rule, the suffrage question, and Mr. Lloyd George. We both heartily disagreed on these subjects, and found it an admirable way of getting warm. It snowed and blew most of the night of the 20th and we expected another bad spell, but this time it passed off without doing us any harm.

I felt very rotten for two days, but was much better after a rest, and on the 22nd, we went back to the Kilik Pass. We went up Kilik East h.s. again on the next day and camped there, but I was not fit enough to take any observations. The following morning, however, Bulnar Singh was out early getting in touch with the various stations, and we were relieved to hear that McInnes had finished observing from Tong-i-tuk (the old Hark station), which he had ascended from the south, after a very hard time. After finishing the observations we came down to our Kilik Pass base camp, where we remained for some days because McInnes sent us word that he wanted the helios. Helio communication was maintained with Kilik East, so that we could know when McInnes had finished. Hearing no news, on the 28th, we went up Kilik West (18,020 ft.), to try and find out what had caused the delay. The Pamir observations were finished off the next day, and those to Tong-i-tuk on the south, but McInnes had not yet signalled through Lupjangal hill station, and we afterwards found he had mistaken the hills. A cutting snowstorm made things unpleasant in the afternoon and we returned to the more congenial atmosphere of the pass. We were again running short of food, owing to the failure of the Chinese supply. McInnes was also in difficulties for want of food, and expecting every day we should be able to finish off our work, we sent him 800 lbs. of *ata*, again went on half rations, and sent out a foraging party under our Hunza havildar; again we were helped by the generosity of the Sarikōlis. A few sheep were bought at ruinous prices.

On the 30th, it was decided to go to McInnes and lend him some help. Some Khirgiz had come in from the Russian Pamirs for medical treatment and Hingston attended to them. Though there was very little medical work for Hingston in our camp, scarcely a day passed that some nomads or tribesmen did not come in for treatment, and Hingston at all hours of the day was to be found busy healing their infirmities. He gained a great reputation, and men would come as much as ten marches for his cures. This left a great impression on the people, and to no small extent contributed, by the good effect it produced on them, to their kindness to us.

These Khirgiz were a very different type from the Sarikōli Tajik we had been accustomed to. All the Mongolian nomads have left the Taghdumbash, and trekked to the sphere of Russian influence. They possess no land or houses in Tashkurghān, and so are quite free to travel from one country to another and become the subjects of any Power, without fear of losing anything by so doing. The fact that the Khirgiz were liable to taxes to both the Chinese and to Hunza was the primary cause of their removal to Russian territory. Colonel Sir Thomas Holdich, after the Pamir Boundary Commission of 1896, wrote as follows:—"There being but a shadowy line of

distinction drawn between the Khirgiz tribal divisions, all of which appear to follow their yearly migrations in search of pasturage on lines which are quite irrespective of national frontiers, we may expect that the whole Khirgiz population will soon be under the domination of the strongest power, possessing the largest share of Pamir. According to information obtained by General Gerard when personally investigating the subject, the Chinese taxation of the Khirgiz is of the most nominal description. All skins of wild animals killed (except *ovis poli*) are given up as tribute to the Amban of Tashkurghān, but no money payment whatsoever. To their own begs, they pay 1 per cent. annually of all their flocks. Such easy terms are no doubt attractive, but will not suffice to keep Khirgiz nomads permanently from Russian influence." *

Sir Thomas Holdich's prophesies have come about, and there are now no Khirgiz living on the Taghdumbash. It is possible that this was hurried by the fear of a money tax, such as the one imposed this year by the Amban of Tashkurghān on the Sarikōlis, and which they have flatly declined to pay. From what we could find out by questioning, the grazing on the Russian side appears to be far richer than that on the Sarikōl. Sir Thomas Holdich records that the grass on the Great and on the Little Pamirs is extremely rich; this is certainly not the case on the Taghdumbash, where the only grass suitable for grazing exists near water and the snow line. Again, in the days of the Commission, it is recorded that the Russians had created a very high rate of payment for all sheep and live stock purchased from the nomads, and had insisted on the strict compliance of this order; and one officer was given a week's arrest for disobedience in this respect. They do not appear to be so particular nowadays.

The reason that the Sarikōlis have not followed suit, appears to be from the fact that they possess houses and land in Tashkurghān, and they seem to be unwilling to give these up, as they would undoubtedly have to do if they were to migrate to the Russian sphere of influence. But it is just possible they too will leave the Taghdumbash if the Amban insists on a money tax.

On the 31st July we marched down to Murkushi, and after our average height of over 15,000 ft. for the last two months, it was like getting down to sea level again. How can I describe the joy of seeing real trees again? Murkushi, which on our arrival two months before had seemed the end of the world, now appeared a regular harbour of civilization. The dwarf willow forest gave us more delight than a walk in Greenwich Park, and I shall always connect willows with this part of the Empire. We camped there

* Report on the Proceedings of the Pamir Boundary Commission, 1896.

for the night and on the 1st August moved out with a very light camp to meet McInnes. After going, however, a couple of miles we received a note from him, saying he was on his way to a forward station, and would be connected through to the Pamir work by the time we could reach him, and that there was no object in our going to him. We therefore left our heaviest kit at Murkushi, and on the 2nd returned to the Kilik Pass, and camped there for some days, anxiously waiting for news. On the 4th we had a helio message from McInnes, through our signaller on Kilik East h.s., to the effect that he had climbed a peak from which he could see Kilik East, and that he intended to connect from this; also that he would observe if fine on the following day. The weather again turned bad during the evening, but the 5th was better, and we went up Kilik East h.s. and found that McInnes was observing to that station. We pitched our 16-lb. Whymper on the summit, and the weather drove us into our sleeping bags early; it was very cloudy all night and a violent snow squall threatened to keep us there for some days.

At last, however, on the 6th we got into touch with Murkushi h.s., and were able to complete the observations and come down, before the clouds obscured the hills. Duffadar Beg put us up for the night, and presented the coolies with a sheep to celebrate the success of the work. We now had no doubt that the work would be finished, for the worst had been done, and there only remained the Chapursān stations. We now hoped to get in ten days' work with the survey camera, and fill in the blanks that had necessarily to be left out during the more important work of completing the link. But we were caught in bad weather near Taghramansu, on the 7th, and on the following morning we awoke to find the ground right down to the Karachukor under a white mantle of snow, while clouds hung very low on the hills. Morning after morning the outlook was the same, the worst spell we had had since our arrival. The clouds seemed to be driven backwards and forwards, up and down the valley, each time the snow being driven almost horizontally, so that it was impossible to see anything. We had now been on half rations for nearly a fortnight, and two maunds of *ata* foraged for by Humayun had been left the other side of the passes, as soon as the weather turned bad. Our ten days' work with the camera had to be abandoned on the 12th, on the morning of which day we only had four days' half rations left, and still the day's ration to issue. The wind was very biting and cold on our way to our depôt at Mintaka Akhsai, and we sheltered from the storm at Faqir Shah's encampment. We bought two sheep at 10 rupees each at Mintaka, as the Sarikōlis were in the same straits as ourselves as regards *ata*, which had gone up to prohibitive prices at Tashkurghān, and was now being refused to them at any price. In the evening, however, three maunds arrived from the foraging party in Hunza, and we felt more comfortable.

Early the next day we started to pack up our depôt, and were able to cut down our kit to a large extent, by the distribution of warm clothing, tins, old bottles, etc., to the Sarikōlis. These latter were immensely appreciated, as were old kerosene oil tins, and it is a useful thing to know that these men almost prefer them to any other form of bakhshish. In the evening a little more *ata* arrived, and I was even able to repay Mahomed Beg for some of his kindness with a present of *ata*, of which he had run out. It was the same dreary day, similar to the previous fortnight, and our last day on the Pamirs was scarcely better.

On the 14th we returned over the Mintaka, a snow squall driving us to shelter in the dâk hut on the summit of the pass with most of our coolies. Now that we were leaving the Pamirs for good, one could not help doing so with a feeling almost akin to regret. It is a desperately inhospitable country where hospitality amongst the tribesmen is a religion. We took away with us memories of a wonderful land, and of a wonderful people, whose kindly characteristics and generous help had lightened our work to a very considerable extent.

REVIEWS.

HISTORY OF UNDERGROUND WARFARE.

Being a Review of the book by A. GRNEZ, Captain of Engineers, French Army.—(Librarie Militaire Berger Levrault, Paris, Rue Des Beaux-Arts 5–7, 1914. Price 5 francs).

(Continued).

FOURTH PERIOD.

Under Louis XV., Marshal Vallières and his son did much to improve the artillery, but it is to Gribeanval that we owe the mobile and powerful weapons in vogue during the revolutionary campaigns. These were wars of manœuvre and movement, hence sieges were exceptional, and even at sieges long range weapons placed beyond the glacis were able to breach the parapets. The continuous enceinte was superseded by detached forts, which, as ranges increased, were placed further and further from the point to be defended. These circumstances limited the use of mines, which were little employed except during the Peninsula War. A few other cases may be mentioned, such as the Siege of Valenciennes in 1793, where the Allied Army under the Duke of York succeeded after a month's labour in laying three mines each containing 4,500 lbs. of powder. Owing to delay caused by want of information, countermining was tried too late, the mines were fired and an assault delivered. It failed at the time, but the town was surrendered three days later.

At the Siege of Acre in 1799 the salient of the counterscarp was blown in by a mine, but two assaults following it were repulsed mostly owing to flanking fire from a high tower on the walls. A deep mine, to blow in the tower, was then commenced. The Turks countermined, but too high. Three mines were fired under the tower, and one under the glacis to fill the ditch. The tower was not greatly damaged, an assault failed and artillery had to be brought up to complete the destruction. Another assault failed and the siege was raised.

During the Siege of Saragossa in 1809 the French had only captured a small part of the town after 30 days' operations. The Spaniards had collected the inhabitants into separate blocks of houses divided from each other by wide streets or public places, each block forming a separate fortress with some large building in it constituting a keep. The houses were barricaded and loopholed. Frontal attacks were out of the question, and mining had to be employed. The defenders tried to countermine, sometimes effectually, and it was not till 20 days later that the town capitulated.

Mont Jouy de Girone in 1809, and Valence in 1812, where the galleries had to be driven under a wet ditch, were captured by the French owing

to the use of mines. In 1812 the English employed them against the Castle of Burgos. There were no engineers, the first explosion only demolished the wall of the escarp, and left the parapet above almost intact, a second charge was better placed, and made a practicable breach which was crowned, but all efforts to advance further failed. The work was carried out by infantry, was very slow, and very trying to untrained and inexperienced men.

At the third Siege of Badajoz the fronts facing the Guadiana were the weakest, and the French had strengthened them by an improvised system of countermines. Wellington knew this, and having no engineers could not hope to succeed in a limited space of time in an attack upon this front. He was compelled to try elsewhere, where not only were the fortifications stronger but an inundation gave additional protection. Numerous and practicable breaches were made by gun fire, but the defenders closed them with sandbag parapets, placed chevaux de frise in front, arranged loops of bombs attached to powder hose, and large barrels filled with tarred straw, grenades, and shells, and posted men to set fire to these and roll them down on the assaulting columns. The counterscarp had not been breached, at the foot of it the defenders fixed another series of bombs under a few inches of earth, and connected together by powder hose covered with gutter tiles. These were fired as the English jumped into the ditch, but did not check the assault. Many men were drowned in a deep trench in the ditch. The remainder were checked by the burning barrels. However a party had managed to scale the St. Vincent Bastion and attacked in rear the defenders of the breach, with the result that a capitulation followed.

The mine defence of the Castle of Mouzon is of interest. The castle was held by 100 French gendarmes against 3,000 Spaniards. All the countermines were planned and superintended by a mine watchman named Saint Jacques who had been at the Siege of Saragossa. The only tools at first available were four pickaxes, three spades, three axes, two hammers and two saws. There were no candles or baskets. Powder was procured from cartridges, candles from melted bullocks' fat, and more tools were captured from the Spanish mine galleries. The place held out from the 27th of September, 1813, to the 18th of February, 1814, when the captain in command ascertained that the French were everywhere in retreat, and capitulated. On no single occasion did the Spaniards fire a mine, Saint Jacques and his men were too quick for them, or the mines were destroyed by sorties.

At the time of the Revolution the globe of compression had given birth to several countermine systems, the general characteristics of which were the omission of the envelope gallery at some distance in front of the counterscarp, and the use of listening galleries disposed as antennæ, whether connected together or not by a transverse gallery some distance in rear of the listeners. General Marescot, the first Inspector-General of Engineers, initiated in 1802 a competition for a treatise on mining. This produced the classic works of Mouzé, Gillot, Gumpertz and Lebrun, which obtained first and second prizes, and honourable mention respectively.

Mouzé's system of attack was based (1) on Belidor's idea that it was

easy to invade the countermines after exposing them by an explosion, (2) on the utilization of Boule's shafts, and (3) on experiments made by himself with regard to the omission of tamping. Mouzé sited his last parallel 52 yards from the nearest listeners, thus assuming *a priori* that the plan of the countermines was known, and from it made a series of attacks by mining without explosives, whilst he pushed on by flying saps over the ends of the listening galleries. There he sank Boule's shafts, which he estimated would take three hours each, placed in each 1,650 lbs. powder, or almost enough to fill it, laid a cover on the top and fired it. Eight miners then excavated in each crater to find the broken gallery, which Mouzé estimated would take an hour, and each gallery was invaded by a party of grenadiers and workmen. They barricaded themselves in the envelope, and thence pushed on to the counterscarp gallery.

Gillot was bolder, proposing to advance by zigzags from the third parallel, and to sink his shafts over, and blow in each listener with 300 or 400 lbs. powder. If the positions of the listeners were unknown, a row of mines at 20-ft. intervals could not fail to find them. Here the fourth parallel was sited, whence the salient place of arms and counterscarp gallery were attacked by shafts. Thus, whatever the countermine system, Gillot in three nights rendered it useless, and reached the counterscarp.

Gumpertz and Lebrun, inspired by Lefevre's advance at Schweidnitz, drove inclined galleries from the last parallel for 35 yards and fired three mines 44 yards apart with as large a L.L.R. as possible. He considered that at 9 yards depth in compact earth, 6,000 lbs. powder should produce craters of which the radius was double the L.L.R. From these craters the attack again advanced, and it was estimated that the counterscarp would be reached and demolished after 45 days' mining, assuming that the attack made no mistake and that the defenders confined themselves to looking on.

From 1815 to 1823 Lebrun was writing a work on countermines. He proposed to build one tier of galleries in earth up to 16 or 26 ft. deep, and if the earth were deeper, two tiers of galleries, the upper to attack the enemy's earthworks, the lower, his mines.

The most striking feature of Mouzé's and Gillot's methods is their overwhelming impetuosity; this probably reflects the military spirit of the times. The garrison would have to be deprived of all energy which could not put a stop to the sinking of the shafts; even if too weak to make a sortie it could considerably delay the work by plunging fire from the ramparts. The firing of even one countermine would send the workmen back to their parallel, and it would be difficult to induce them to face the work again.

This bold method of attack by shafts, however, produced modifications in the design of countermines, and in 1820 Colonel Rohault de Fleury invented a system of "countershafts," *i.e.* mines placed over the ends of the listeners just underground, so that their craters would give no cover to the assailants, and so far above the gallery roofs that a charge capable of damaging the enemy's galleries, would leave the protected gallery unharmed. This system was only introduced slowly, owing to its practical difficulties. At first excavations were made down

to the roofs of the listeners, which were protected by shields, but in 1828 Colonel Thuillier invented the first camouflet machine, which enabled the deep excavation, and consequent disturbance of the soil over the gallery, to be omitted. It also permitted of placing the mine from the gallery, and loading it by cartridge. These mines were then called "countershaft camouflets." The *attaque brusquée* was thus put a stop to.

Following on improvements in ventilating and firing apparatus, countermine systems were simplified. In the same gallery charges were laid in pairs, that furthest in front was first fired, that in rear, placed in the tamping of the former, exploded into the first crater. The new fuze gave so little smoke, and the renewal of air was so rapid, that it was even found possible to fire the first charge before tamping and firing the second.

Shortly afterwards it became customary to place a charge in position after the tamping was finished; the use of bored mines facilitated this procedure. The idea was not a new one, as a modified form of bored mine had been used at Candia, but now assumed fresh importance owing to the introduction of improved boring apparatus. For a time it was considered that the attack had acquired such a valuable weapon that the countermine was doomed, but practical experience proved that this opinion was not justified. The drill was frequently stopped by stones, or the ground was so hard that large numbers of men were required to work it. The Siege of Sebastopol finally burst the bubble of the bored mine, principally because it was found impossible to expose more than two or three men at a time under curved fire. Boring however still had its uses as a method of underground reconnaissance.

Major Laloy tried at Arras in 1854 an improved method of procedure analogous to that of Lefevre at Schweidnitz, but gave the miner some protection against the countermines of the defence, and considerably shortened the interval of time between each explosion. To fulfil the first condition 5 to 7 ft. of cases were erected and covered with earth in the first craters, which were to be opened by large mines at some little distance from the countermine system. Inclined galleries were then driven as far as verticals through the front edges of the first row of craters. The earth piled on the cases placed above ground in the craters, acted as additional tamping, and prevented the effect of the mine at the end of such a short gallery taking place backwards. If the defenders fired a countermine, part of its effect would only be to throw more earth into the crater and increase the L.L.R. In ordinary ground successive globes of 900 to 1,000 lbs. could be placed and fired at 12 to 15-hour intervals, securing an advance of about 13 ft. on each occasion. The mines were placed in rows close enough together to leave nothing untouched between them.

Thus at the opening of the 19th century the art of mining was held in great estimation, but countershafts, and charging after tamping were hardly applicable in actual warfare. The Siege of Sebastopol demonstrated that the most simple processes were the only practicable ones, but the attackers were confronted by worthy antagonists. The Russians were past masters in the art of underground warfare, and had acquired

practical experience of it at Brailov and Varna during the Russo-Turkish War in 1828.

The fortifications of Brailov consisted of a semi-circle of small bastions joined by long curtains, the ditch was dry, with revetment walls. The place contained a large garrison, and communication across the Danube was open. There were no countermine galleries. On the 11th night of the siege three covered saps were pushed from the third parallel, two towards No. 1 Bastion, and one towards No. 2. A large mine of 8,500 lbs. powder was placed against the counterscarp between the Danube and No. 1 Bastion, six of 800 to 1,000 lbs. each in a gallery behind the counterscarp on the attackers' left of No. 1 Bastion, and another of 8,500 lbs. under the foundations of the escarp. Two mines of 2,500 lbs. each were placed under the escarp of No. 2 Bastion, and four of 800 to 1,000 lbs. each along the counterscarp. These were to be fired simultaneously in three groups, (1) the large mine near the river, (2) the mines of No. 1 Bastion, (3) the mines of No. 2 Bastion, and an assault launched immediately. The signal to fire was to be three rockets. Unfortunately the officer in charge of No. 1 Group fired after the second rocket, and buried the junction box of No. 2 Group, consequently when the third rocket went up only No. 3 Group could be fired. Practicable breaches were formed by the mines which exploded, No. 1 having thrown a quantity of earth against the escarp opposite. The assault was delivered, but failed, partly owing to the stubborn resistance of the Turks, partly because the right column had to make a flank march, and lost heavily in doing so, and partly because the earth thrown by No. 1 Mine against the escarp slipped down under the feet of the attackers, and was soon too steep to climb over. The left assault reached No. 2 Bastion, but was there forced back, and 1,500 to 1,800 men were lost in a counter-attack. Next day the second group of mines was fired, all the craters crowned, and the ramparts heavily shelled by artillery. A sortie was repelled, and next day the place was surrendered after 24 days of open trenches.

In a report of the siege written by an artillery colonel it is stated that breaches might easily have been made by the guns more quickly than by mines, but the engineer corps dominated the siege, which was conducted by its first Inspector-General. The failure of the second group of mines shows how important it is in war to avoid complicated methods. It would have been better to fire each mine separately. In regard to this criticism it may be considered doubtful whether the artillery could have demolished the counterscarp walls, even if they had succeeded in making practicable breaches in the escarps. Certainly the absence of countermines contributed largely to the rapid success of the Russians.

The fortifications of Varna were much the same as those of Brailov. The Russian left rested on the Black Sea opposite No. 1 Bastion, which was separated from the sea by a ditch 170 ft. wide. The counterscarp was formed by a cofferdam cutting off the waters of the ditch from the sea. Between Nos. 1 and 2 Bastions, at right angles to the seashore, the ditch was 190 yards wide opposite the curtains. In the middle of the ditch was a stream which formed several pools. Trenches were opened on the 7th of August, 1828. The escarp of No. 1 Bastion was

soon breached by gun fire, and opposite the breach five shafts, 56 ft. apart, were sunk, and 1,200 lbs. powder placed in each to blow down the counterscarp. These were fired about a month after the commencement of the siege, but the earth thrown into the ditch was not nearly enough to fill it, and no assault could be attempted. The Russians then worked along the outside of the cofferdam, and also drove covered saps across the ditch. No. 2 Bastion was attacked similarly. Here the bed of the stream was very deep, but at length one mine of 5,000 lbs., and another of 2,000 lbs. were placed under the escarp. The quantity of powder would have been increased, but the Turks showed signs of countermining, and it was decided to hasten the explosion. No. 1 Bastion was breached on the 21st of September, and No. 2 on the 22nd. The Turks had prepared a retrenchment in rear, and an assault would have failed. It was decided to make new breaches in the curtain, but the town was surrendered on the 28th. Had the Turks known a little about countermining the Russian works would have been very much delayed.

Siege of Sebastopol.

Omitting any description of the surroundings and fortifications, the mining operations only will be touched on. Trenches had been opened on the 3rd of October, 1854, and by the 1st of November the third parallel was at 170 yards from the Flagstaff Bastion. The French commenced their galleries on the 20th, with the intention of breaching the bastion prior to an assault. Two shafts were sunk into the rock, when a bed of clay was found in which progress was rapid. It was not anticipated that the Russians had any countermines, and the first intimation of their existence was the blowing in, on the 3rd of February, 1855, of the head of the right gallery by a camouflet.

At the beginning of November the defenders thought they heard sounds of mining, and Colonel Todleben decided to organize a system of countermines. (On the 1st of January he received a plan of the French siege works which had been lithographed in Paris). His plan was to excavate an envelope gallery under the ditch of the bastion, with listeners at right angles to it. Twenty shafts were sunk into the same bed of clay which the French had discovered, but Todleben was not satisfied that his first scheme afforded sufficient protection, and relying on the motto that "the lower man has the upper hand," commenced a lower tier of galleries in a second layer of clay about 50 ft. below the surface. This lower tier comprised 480 yards of gallery, and was never used, but a mine of 9,000 lbs. of powder was discovered after the siege, at the end of one of the galleries. The lower tier had, however, a great moral value in relieving the miners in the upper galleries from the apprehension of being undermined.

Finding that they could not surprise the enemy, the French now determined to join up transversely their own principal galleries, to drive a series of galleries for mines the craters of which would intersect, to fire them simultaneously and so open a fourth parallel. After several mines had been fired on both sides the series of mines was charged by the 10th of April. There were twenty of them, varying from 1,200 to 4,200 lbs. each, up to a total of 57,000 lbs. After the explosion the

craters were occupied and gave excellent cover, but a few mines had failed, and some craters had to be joined by sap. Owing, however, to the incessant fire and sorties of the garrison this parallel could only be occupied at night. It was connected up to the third parallel by some mine craters joined by saps. The mines which had missed fire were untamped and fired by degrees, not without casualties to the French troops.

The action of the mines had not extended far, and the Russians were soon able to repair their galleries and advance again. The French therefore practically only held the rear slope and bases of the craters. However, they were able to put listeners on a banquette on the forward slope to give notice of attempts on the Russian side to mine under the parallel, and to drive them away by mines placed in hastily excavated shafts. In other words the attackers were reduced to defensive tactics.

Meanwhile the Allies had realized that the capture of the Green Mamelon, which commanded Fort Malakoff, would entail the fall of Sebastopol. The attack on the Flagstaff Bastion thus became of secondary importance, and was only continued to occupy the attention of a portion of the garrison, and as a defensive measure, to prevent their advance under the fourth parallel. A number of fougasses were fired from that parallel, as the bastion was within range, but besides annoying the Russians they did a considerable amount of damage to the French galleries in rear.

On the 2nd of May the French had armed a battery, No. 53, against the Central Bastion and the Schwartz Redoubt which covered its left flank. In the middle of May the Russians, in expectation of a possible subterranean attack in this quarter, opened countermine galleries of similar design to those at the Flagstaff Bastion. On the 14th of August, hearing the noise of a deep sap by which the French were connecting Battery 53 with a stone quarry on its left, they fired a mine in a hurry. It did no damage to the French, and was a lucky event for them, as a few days later the Russians would have been under the battery. A subterranean war now began in front of Battery 53. Several mines were fired, but neither side gained any particular advantage.

Countermining was commenced somewhat tardily from the Malakof, on the same principles as before. Fourteen listening galleries from an envelope gallery were driven at right angles to the counterscarp, and stepped shafts in the rock led down to another tier of countermines 50 ft. beneath the glacis. By the 8th of September the upper listeners had advanced 26 to 40 ft., and four lower listeners about 17 ft. When the French obtained knowledge of these works they sank twelve shafts, from which galleries ran towards the salient of the fort. On the 6th of September, the date of the assault of the Malakof, the only three mines which there had been time to charge were fired at eight in the morning. These mines would certainly have damaged any countermines within reach, but the main object in firing them was to prove to the troops of the assault that their own miners held the mastery of the subsoil. The capture of the Malakof ended the siege. It was rendered possible only by the delay of the Russians in countermining. The latter had been preoccupied by the defence of the town, but had the countermines of the Malakof been in a more forward state, the result might have been different.

On the French side the length of gallery and branches was about 1,200 yards in front of the Flagstaff Bastion, and 130 yards before the Schwartz Redoubt. The Russians excavated 3,000 and 2,200 yards respectively, and 550 yards in front of the Malakof. Before the Flagstaff Bastion there were 125 explosions, and before the Schwartz Redoubt 11 only. The total weight of powder consumed in mines was 115,000 lbs., as compared with 6,600,000 lbs. expended by the artillery, but of 176 casualties amongst the French miners, including 17 killed, only 4 were killed in the galleries. This must be attributed in some measure to careful listening. The Russian miners incurred 191 casualties, including 54 killed; out of these 24 were killed and 32 wounded in the galleries.

The French mines established for opening the fourth parallel were each provided with two distinct means of firing, firstly, La Rivières fuze laid on the ground, each length starting from junction boxes filled with 4½ lbs. powder, and secondly, ordinary powder hose laid in troughs and starting from the same junction boxes as the respective lengths of fuze. There were six misfires, which may have been due to the different rates of burning of the fuze and powder hose. Symmetry in the means employed for the double transmission of fire is most necessary.

Several cases of suffocation occurred in the galleries. Very thorough ventilation is necessary, and apparatus should be at hand enabling foul mines to be entered with impunity.

The Russian countermines started very regularly, but once contact with the enemy underground was established all semblance of regularity was lost. Each miner seems to have worked independently, without reference to his neighbours. The drawbacks to following no definite plan are self-evident; not only might a great deal of the work done have been saved, but it must frequently have been impossible to distinguish sounds made by the enemy from those made by a neighbour, and no large mine could be fired without damaging adjacent galleries. The lower tier of galleries was almost useless for mines. The 9,000 lbs. mine found after the siege would only have been a huge camouflet, as there were 17 yards of rock above it. This criticism does not imply that a lower tier is in no case necessary, it gives confidence to those working above, but should not be commenced, when time presses, until the upper tier has been completed.

The Russian gallery cases were frequently fixed very carelessly. This may have been due to rapidity of execution, which in mine warfare is the first condition to be fulfilled. On the other hand the tamping, which consisted of sandbags strengthened by wooden frames, was finished most minutely, interstices being often closed with rags. Voltaic batteries seem to have been used for firing the mines, and it is probable that misfires were frequent.

In front of the Carenage Battery the Russians had placed a row of boxes each containing 15 to 20 lbs. powder, and destined to be fired by a liquid escaping from a glass tube, which would be broken by the steps of the assailants. These land mines were discovered before the attack.

A.R.R.

(To be continued).

FUNDAMENTALS OF MILITARY SERVICE.

By CAPT. LINCOLN C. ANDREWS, U.S. Cavalry.

The aim of this work is set out in the Dedication which reads as follows:—"To the Memory of our first President, whose profound Statesmanship demanded for the future of this Democracy that her citizens be organized and trained in arms, this book, designed to aid in that consummation, is reverently dedicated."

The scope of the publication is more fully explained by the author in his preface; he points out that, in the United States, the organic law makes military service obligatory for each male citizen between the ages of 18 and 45 years. He proceeds: "Therefore an honest performance of the duties of citizenship demands, first, that each citizen shall learn enough about the military service and its needs to give him an *intelligent opinion* thereon; and second, that each youth shall prepare himself reasonably to meet his individual responsibilities as a citizen soldier. . . ."

"This book is designed to supply the means for attaining these qualifications for citizenship, to place in one volume the fundamentals of military service, its meanings and its requirements."

It is further stated in the preface that it is intended that this work should be studied in connection with the Field Service Regulations and the *Drill Regulations for the United States Army*. The book has been prepared under the supervision of Major-General Leonard Wood, U.S. Army, and certain of the chapters have been contributed by officers who have made a special study of the subjects dealt with by them.

The first chapter deals with "Our Military Policy"; the opening paragraph reads:—

"The Military Policy of the United States has been expressed in its monetary motto: 'In God We Trust' and this with but scant recognition of its vital corollary, that *faith without works availeth not.*"

The author goes on to state that America, as a nation, has sedulously avoided everything military and that no attempt has been made to educate the youth of the nation, and "our millions of citizens coming from other governments," to any true appreciation of American nationalism, aspirations, true traditions and actual history. In a very brief review of the military history of the United States, he sums up the situation in the following words:—"And finally there stands our great Civil War, the glaring example of the inefficiency of our system and of its extravagant waste of life and money." "Civilian control of military matters quite beyond their comprehension" is held responsible for the "vastly inefficient and wickedly wasteful and extravagant" measures adopted with regard to the recruiting and control of the American Army in the past. It is pointed out that whether in democracies or in monarchies the requirements as regards defensive measures are to-day the same; the mobilization of vast forces is necessary. A machine so vast and so complicated, it is recognized, will take time in building, and, in consequence, the author of the work under review urges that if his countrymen hope for an army that may ever run efficiently then "skilled brains and hands had better be employed in its construction."

The second chapter deals with the "Psychology of the Service." It is pointed out that "Military Service is our most ancient public institution. In the history of the world no free people have ever existed without it." The author proceeds:—

"Far from being a characteristic of imperialism, universal military service is the very corner stone of the edifice of Democracy; where the liberties of the people are the one aspiration of government, the people must be trained and ready to defend these liberties."

The truth contained in the foregoing extract has gradually permeated upwards and downwards through all ranks of society in this country during the past two years, and the measures recently adopted by the British Government, to ensure that adequate preparations may be made for the prosecution of the Great War we have on hand, indicate that the obligations of citizenship are at last fully recognized in our own island kingdom. There is therefore reason to hope that the British Democracy may yet continue to exist and to thrive.

The sub-sections of this chapter deal, *inter alia*, with such important matters as Subordination, Leadership, the Battlefield. The author truly says: "In battle, and in preparation for battle, there are but rare occasions for 'individual plays.' Success may be attained only through the unselfish playing for the team." It has at all times been necessary for a soldier to be an altruist; if anything, the need for this quality is greater to-day than at any other period of the world's history.

Discipline, it is pointed out, is as vital to the success of an army, as live steam to the operation of a locomotive; it represents "75 per cent. of battle efficiency." The author states: "Men and arms we may command, but money cannot buy discipline, nor munition plants supply it. It is of the very essence of training, and springs from the intelligence and conscientious work of the leaders who must inspire it, or whose incompetence will render its attainment impossible."

In dealing with the qualities for Leadership the author points out that the subject should appeal particularly to the citizen soldier, as these qualities will be of equal value to him in his civil pursuits as in his military career. Some excellent advice on this subject is contained in this chapter. The would-be leader is told that to attain the confidence and respect of his men the first requisite is *superior knowledge*, and that "A good leader is as one with his men, he speaks their language, he shares their blessings and their hardships, he is jealous of their name, he defends their sensibilities and their rights in the larger organization, in fact he is the recognized guardian of their welfare, physical and mental, as individuals and as a group."

"The psychology of control of men on the battlefield is," says the author, "a big subject, of vital importance to leaders." Man is largely controlled by his emotions; it is the task of the leader to study the mentality of the human race, in order that he may be in a position to control these emotions in critical situations. He can do so with success by training his command to meet such a situation and by setting an example in his own conduct and by showing resource when the emergency arises.

The remaining chapters of the book deal with military training,

organization, the drill and *rôle* of the various arms of the service, tactical rules, military courtesy, guard and riot duty, musketry, map reading, care of arms, Army Regulations, patrolling, security, marches and convoys, camps and bivouacs, supply and transportation, sanitation and horsemanship. The information contained in these chapters will be found in the various manuals and books of regulations published by authority for the use of the British Army. However, those who desire to get a general bird's-eye view of military matters without spending much time in wading through the literature on the subject cannot do better than to read through the pages of the *Fundamentals of Military Service*. Among other things, it will be found that in the chapter on "Tactical Rules," the author of this work has succeeded in compressing the essential principles for handling men and situations in the presence of an enemy into the compass of three small pages. One of the most important of these principles for the young soldier to bear in mind is the following:—"If ordered to any military undertaking, never start on your mission until you have a clear understanding of each of the points you should know for its proper performance."

In the chapter on "Military Courtesy" the young soldier is informed that the observance of the forms of military courtesy is a measure of the discipline and soldierliness of an army; and in reading the pages of the little volume under review he will learn much concerning those traditions and customs of the military service which have done so much in the past to promote comradeship and a good understanding in the great profession of arms.

W. A. J. O'MEARA.

GEODETIC SURVEYING.

By EDWARD R. CAREY, C.E.—(John Wiley & Co., New York. Chapman & Hall, Ltd., London).

Geodetic Surveying is a text book on survey and is chiefly intended for those studying for the United States Survey, as frequent reference is made to the forms and methods employed in the U.S. Coast and Geodetic Survey. The book is well illustrated with diagrams and photographs depicting instruments, reference marks and beacons used in the U.S.A. It opens with a short introduction defining survey and explaining the broad principles of triangulation.

Chapter I. deals with Preliminary Reconnaissance and gives several useful tables and formulæ for use in obtaining the necessary strength of figures, heights by barometer and boiling point, and corrections for curvature and refraction. There are also a few photographs illustrating the beacons in use at several of the U.S. Coast and Geodetic Survey Trig. Points.

Base Measurement is the next subject and is contained in Chapter II., it includes the description and use of measuring bars and tapes, the

calculations connected with base measurement, formulæ and tables for temperature, sag, grade, and tension corrections.

Chapters III., IV., V., and Appendix I. deal with the measurement of angles, the elimination of errors in angular measurements and the computations for latitudes, longitudes and azimuths, etc. These chapters also include explanations of the many types of instruments used in angular measurements.

Chapter VI. describes and explains various map projections.

Chapters VII. and VIII. deal with levelling. This subject is divided under two heads, trigonometrical leveling with a theodolite (Chapter VII.) and precise leveling with instruments of the dumpy and "Y" types (Chapter VIII.).

As each subject is taken into consideration a full description is given of the types of instruments used. Mention should be made of the fact that in Appendix II. the method of least squares is briefly discussed. The book is supplied with a good index which enables any subject to be easily referred to.

D.A.H.

ON THE MANUFACTURE AND TESTING OF PRISMATIC COMPASSES ESPECIALLY MARK VII. MILITARY PATTERN.

By F. E. Smith, A.R.C.SC.—(Reprinted from and by the *Optician and Photographic Trade Journal*).

This little book an extract from the transactions of the Optical Society is of particular interest to the manufacturer of prismatic compasses, as it discusses practically all the errors likely to be found in a prismatic compass. These errors are briefly summarized as follows:—

(1). Error due to want of parallelism of axis of magnet with the 180°–360° direction as indicated on the dial.

(2). Error due to eccentricity of dial and point of suspension.

(3). Error due to centre of suspension not being in plane containing slit and line.

(4). Error due to want of uniformity of the engraved divisions on the dial.

(5). Error due to sighting line being out of vertical when the compass is supported on a horizontal surface.

(6). Error due to prismatic effect of the glasses (window and cover).

(7). Error due to magnetic material in the case screws, etc.

(8). Error due to faulty setting of the prism in the prism box.

(9). Error due to excessive friction between pivot and jewel.

Each of the above errors is dealt with in detail and the tests described are exclusively those made at the National Physical Laboratory.

Mr. Smith points out that while his remarks are applicable to compasses in general, he deals particularly with Verner's Pattern, Mark VII. prismatic compass. The book is illustrated with diagrams and the discussion following the reading of Mr. Smith's paper is also reprinted.

D.A.H.

NOTICE OF MAGAZINE.

REVUE MILITAIRE SUISSE.

No. 5.—May, 1916.

ORDER OF BATTLE OF GERMAN ARMIES IN WESTERN THEATRE OF OPERATIONS.

The *Revue* article, which is accompanied by four sketch maps, gives the dispositions of the German Armies during the period 22nd August, 1914, to the autumn of 1915. On the first sketch map are shown the positions of the seven Armies, and of the Detachment stationed in Upper Alsace, during the Frontier Battles—22nd to 24th August, 1914—and at the Battle of the Marne, 10th September, 1914. The dispositions were as follows :—

Armies.	Composition.	Commanders.	Location.	
			During Frontier Battles.	Battle of Marne.
I.	II., III., IV. and IX. A.C. (Active Army) and III., IV. and IX. A.C. (Reserve).	von Kluck.	S.W. and S. of Brussels.	N.E. of line Compeigne - Chateau Thierry.
II.	VII. and X. A.C. (Active Army), and VII., X. and Guard A.C. (Reserve).	von Bulow.	N.W. of Namur.	E. and S.E. of Chateau Thierry.
III.	XII., XIX., XI. A.C. (Active Army) and XII. A.C. (Reserve).	von Hausen.	S. of Namur.	S. of Chalons.
IV.	VIII. and XVIII. A.C. (Active Army) and VIII. and XVIII. A.C. (Reserve).	Duke of Wurtemberg.	N.W. of Longwy.	W. of Sermaize.
V.	V., VI., XIII. and XVI. A.C. (Active Army), V. and VI. A.C. (Reserve) and 33rd Reserve Division.	Crown Prince of Germany.	E. and S.E. of Longwy.	On line Sermaize-Verdun.
VI.	XXI. A.C. (Active Army), I., II. and III. Bav. A.C. (Active Army) and I. Bav. A.C. (Reserve).	Prince Ruprecht of Bavaria.	S. of Metz and E. of Nancy.	N.E. of Nancy.
VII.	XIV. and XV. A.C. (Active Army), XIV. A.C. (Reserve) and some Ersatz formations.	von Heeringen.	N.E. of St. Die.	On line Nancy-St. Die.
Det.	Reserve and Landwehr formations.	—	N. of Mulhausen.	N.W. and W. of Mulhausen.

The only change which had taken place in the composition of the German Armies between the 24th August and 10th September was the

transfer of the XI. A.C. (Active Army) from von Hausen's Army to the Eastern Front; this was carried out towards the end of the former month.

The second sketch map shows the positions of the German Armies on the 3rd October, 1914, in connection with the German "March to the Sea." In the interval which elapsed between the 10th September and the 3rd October considerable changes had taken place in the composition of the several German Armies and also in their relative positions in consequence of the lateral movements carried out from the left towards the right. The following statement summarizes these changes :—

Army.	Composition.	Commanders.	Location.
VI.	Cavalry, Guard and IV. A.C. (Active Army) and I. Bav. A.C. (Active Army).	Prince Ruprecht of Bavaria.	E. of Arras.
II.	I. and II. Bav. A.C., XVIII. and XXI. A.C. (Active Army) and XIV. A.C. (Reserve).	von Bulow.	On the Somme W. of Péronne.
I.	II., III. and IX. A.C. (Active Army) and IV., IX. and III. A.C. (Reserve).	von Kluck.	On both banks of the Oise, N.E. of Compeigne.
	NOTE.—There is some doubt about the last-mentioned A.C.; it may have been sent to Belgium.		
VII.	VII., X., XII. and XV. A.C. (Active Army), VII. and X. A.C. (Reserve) and a Landwehr Brigade.	von Heeringen.	N. of Rheims.
III.	VI., VIII. and XIX. A.C. (Active Army), XII., VIII. and XVIII. A.C. (Reserve) and 17th and 49th Landwehr Brigades.	von Einem in place of von Hausen.	In the Champagne, S. of Rethel.
V.	V., XIII. and XVI. A.C. (Active Army), III. Bav. A.C., V. and VI. A.C. (Reserve), 33rd Bav. Division, Ersatz and Landwehr formations.	Crown Prince of Germany.	In the Argonne and Woevre, N. and E. of Verdun.

The left wing of the Germans now consisted of Reserve, Ersatz and Landwehr formations, which occupied the positions vacated by the VII. and VI. Armies.

It will be noticed that the IV. Army was broken up, its Army Corps being transferred to the III. and New II. Armies.

The third sketch map shows the positions of the German Armies at the time of the Battle of the Yser.

A IV. Army was reconstituted previous to this battle and placed under the command of the Duke of Wurtemberg. It consisted of the III. A.C. (Reserve) taken from I. Army, 4th Ersatz Division, XXII., XXIII., XXVI. and XXVII. A.C. (Reserve).

The composition of the VI. Army had also been altered; it now consisted of the XIX., Guard, IV., VII. and XIV. A.C. (Active Army) and I. Bav. A.C. (Reserve).

The XXIV. A.C. (Reserve) had reinforced the formations in Alsace and Lorraine already in these provinces.

The II., I., VII., III. and V. Armies remained as before except in so far as they were affected by the transfers noted above.

The positions of the German Armies were on the 24th October, 1914, as follows:—

IV. Army and Cavalry. N. of Ypres.
VI. Army. W. and S. of Lille and E. and S. of Arras.
II. Army. W. and S. of Peronne.
VII. Army. From the Oise, S. of St. Quentin to Rheims.
III. Army. S. of Rethel.
V. Army. Between the Aisne and the Meuse, N.W. of Verdun.

Det. of V. Army;—N., E. and S. of Verdun and between the Meuse and the Moselle, from S. of Verdun to N. of Nancy.

Reserve, Ersatz and Landwehr Formations;—From the Moselle, N. of Nancy to Mulhausen and Swiss Frontier.

The fourth sketch map shows the positions of the German Armies on the 31st December, 1914. Many changes had taken place meanwhile, and are shown below:—

Army.	Changes.	Location.
IV.	Decrease: III. A.C. (Reserve). Increases: Marine A.C. and 37th and 38th Landwehr Brigades.	From sea, N. of Ypres to S. of Ypres.
VI.	Decrease: 1st Div. of Guard. Increases: A Brigade of X. A.C. (Active Army), II. Bav. A.C. (Active Army), 6th Bav. Reserve Div. and 11th Landwehr Brigade.	On line Ypres to S. of Arras.
II.	Decrease: II. Bav. A.C. (Active Army). Increases: 1st Div. of Guard and 20th Landwehr Brigade.	S. of Arras to S. of Peronne.
I.	Decrease: II. A.C. (Active Army). Increases: 10th and another Landwehr Brigades.	S. Peronne to the Aisne N.W. of Rheims.
VII.	Decrease: XV. A.C. (Active Army). Increase: 25th Landwehr Brigade.	From the Aisne N.W. of Rheims to E. of Rheims.
III.	Decreases: One Division of VIII. A.C. (Active Army), XIX. A.C. (Active Army) and one Div. of XVIII. A.C. (Reserve).	E. of Rheims to r.b. of Aisne.

The detachment of V. Army under von Strantz consisting of the V. A.C. (Active Army), III. Bav. A.C. (Active Army) and one Ersatz A.C. occupied a position extending from left of III. Army on r.b. of the Aisne circling to the N. and E. of Verdun. Reserve, Ersatz and Landwehr formations carried the German left to the Swiss frontier.

The composition of the German Armies on the 9th May, 1915, on the eve of the Battle of Arras and on the 29th September, 1915, at the beginning of the Battles in the Champagne are given in the *Revue* article in tabular form and give some indication of the constant changes which have been in progress since the present trench warfare was inaugurated.

The Battles in the Champagne came to an end on the 5th October, 1915; from the 25th September to 5th October, 1915, the number of battalions on the Champagne front were increased from 70 to 108 battalions, partly by pushing reserves into the front line and partly by transferring troops from other parts of the Western Front.

SOME OF THE PRECEPTS OF THE WAR.

"Skill will beat mere brute strength."

Redemption by Fire Effect.

"Fire effect is not everything, that's true, however without it nothing can survive, everything becomes mere cannon fodder."

It is pointed out by the author of the *Revue* article that in the earlier part of this article he has shown in what directions improvements can be effected in military training.

An extract from *Le Tir pour vaincre* is reproduced in the *Revue* article; in it the statement occurs: "Those who have heard bullets whistle past their ears, those who have been in the presence of death, those who recall that they were only able to advance or to hold on to their positions by putting their faith in the heavy pieces of their comrades of the artillery—since they had no confidence in themselves—these will guess what we are about to tell.

"Such persons are indeed convinced of the necessity which exists for a country to possess citizen-soldiers knowing well how to handle a rifle, such, for example, as the (Swiss) *tirailleur d'élite*; soldiers who are *marksmen* rather than *sharpshooters*."

The Swiss are enjoined to seek at once to profit by the above remarks and not to wait till the bullets whistle past their ears before taking to heart the lessons contained therein. It does not require deep meditation to convince one's self that in *the superiority of its fire effect lies more than ever the secret of an army's power, and that by this factor must be measured the value of an army as a fighting force.*

This superiority the Swiss, maybe, already possess but their desire is to improve upon it. The question is asked: But how is that to be done? The reply is given in the subsequent sections of the article; all that can be said here is that when a marked improvement in their training has been brought about then will the Swiss have the right to speak of fire effect being "*the Redeemer.*" *The Redeemer*, not only by reason of its efficacy on the battlefield, but also and above all because of the feeling of confidence, of power and of invincibility with which the Swiss soldiers will then be inspired.

The Swiss people have made rifle-shooting a national sport; it is a form of sport which has a high educational value, since it develops and maintains, in the highest degree, a warlike spirit.

Warlike Spirit.

"A nation possessing a warlike spirit is mistress of its own destinies."

Major d'André has said: "One of the most important means—the simplest in every way, the most immediate, the most rapid—for developing and nourishing a warlike spirit in a nation, is the creation of a widespread taste for rifle-shooting."

This warlike spirit is of inestimable value. It is in this that resides the will to conquer, the strength to resist, in a word, the patriotism of an army and of a nation. Major d'André has defined it as the *resultant of the active moral forces; e.g.*, boldness, courage, *élan*, enthusiasm,

initiative, etc. In order that these moral forces, which are factors indispensable for securing victory, may be efficacious, they must be *disciplined*, that is to say, completed by complementary *passive moral forces*: *e.g.*, discipline, devotion, self-sacrifice, endurance, tenacity, etc. Major d'André seems to consider the latter qualities, to which he has applied the term *esprit militaire*, as being antagonistic to the former, to which he applies the designation *esprit guerrier*. The writer of the *Revue* article does not concur in this view of the matter; he takes the view that a soldier imbued solely with the *esprit guerrier* or solely with the *esprit militaire* is deficient in moral equipment.

It would seem that the French have, in recent times, been passing through an evolutionary period in this matter; General Cherfils has recently declared the nature of the new mentality of his compatriots. He says: "Our *poilu*, our grenadier of to-day, is a hero, a *guerrier admirable*: but he is too independent; he is not sufficiently a *soldier*, that is to say, the well-disciplined man who, bound to his neighbours by the spirit of subordination induced by the military chain of command, forms with these neighbours well-regulated and strong fighting units. The German, on the other hand, is not a *guerrier*. He is individually very inferior to the Frenchman; but he is a *soldier*. Discipline is as the very marrow in his bones. Therein lies his power. We have somewhat lost sight of the first precept in our military catechism, which teaches that: 'In discipline lies the principal strength of armies, therefore it is necessary for every superior to obtain from his subordinates unhesitating obedience at all times.' This precept must be relearnt by us."

The writer of the *Revue* article states that happily the Swiss have not forgotten this "first precept in our military catechism." What is wanted in Switzerland are marksmen possessing battle training, *animated in the highest degree with the "esprit guerrier,"* and thoroughly impregnated with the true *esprit militaire*. Then, and only then, will Switzerland possess the *soldat complet*, the ideal combatant Major d'André has in mind. The method of forming this ideal soldier is explained in the following sub-sections.

Swiss Marksmen.

The writer of the *Revue* article is of opinion that the reproaches contained in Major d'André's book cannot, at all events, be flung at the Swiss. Much rifle practice goes on in Switzerland and it is carried out on sound lines. The brilliant results obtained at matches and the fact that numerous shooting competitions take place in Switzerland are, however, likely to create, it is thought, the false impression in the public mind that there is nothing to compare in the matter of rifle practice with what is done in Switzerland. It must be borne in mind that all Swiss soldiers are not skilled "Swiss marksmen" and that's the pity of it. The efforts made to complete the education of the marksmen in the Swiss Army have not produced the results that the authorities had a right to expect. The present war shows that new requirements have to be met by infantrymen, as well as by the other branches of the Service, and it is, therefore, incumbent on the prize-shot of peace-time competitions so to perfect his education as to become the ideal battlefield marksman so greatly in request in a modern war.

Battlefield Marksmen.

It is a good thing for one to familiarize one's self with the realities of the battlefield of the future in order both to understand what is required of the marksman and how best he can be trained to fulfil his duties. The use of large targets for musketry practice and the practice of firing in leisurely fashion, which allows of deliberate aim being slowly taken, are conditions far from those with which the soldier is faced on service. The battlefield target consists of silhouettes difficult to discern, which appear and disappear at irregular intervals from behind a parapet with disconcerting suddenness. The skill required to place a shot with accuracy and rapidity on such a target—before the firer can himself be put out of action—is of no mean order and can only be attained as a result of great care in training. Only soldiers who possess a high degree of skill in this respect are worthy of the title of "battlefield marksmen."

Practice at targets with the ordinary bull's eyes is only the first step in the training of a marksman; this is the infancy of the art. What is wanted on the battlefield is a marksman who can hit the most difficult targets at any range, whether he is able to take deliberate aim or must fire hastily.

First Stage in the Training of the Marksman.

In Switzerland, the recruit receives his first musketry lessons from the Officer Commanding his unit and the Company Instructor; it includes a course of target practice, 100 rounds being allowed for the purpose. The allowance of ammunition is held to be insufficient; particularly in view of the fact that 50 rounds are fired as a preliminary practice in order to accustom the recruit to his rifle and to feel at ease. A total of 67 days is allowed for converting a recruit into a trained soldier; in spite of the short time allowed a large percentage of the recruits prove themselves good shots at the ordinary targets. However, it is as well to recognize that the training of the recruits in musketry is, at the end of this course, still far from being complete.

Improvement of the Marksman.

Compulsory Practice.

On the completion of the recruits' course, the young soldiers, whether they be good or bad shots, are drafted into their units. Before the present war the measures adopted in Switzerland for improving the individual marksmanship of the soldier are said to have been faulty. He fired certain courses as a recruit, but the Legislature had entrusted the task of the further instruction of Swiss soldiers in musketry and target practice to rifle clubs, a task which all clubs were not in a position suitably to carry through. It was difficult to deal with the slackers. Clubs which had the desire to fulfil their national obligations did not possess the power to give effect to their resolutions.

The Swiss military authorities recently took up the matter, and in 1914 new regulations relating to compulsory practice were promulgated. However, the mobilization of the Swiss Army which took place in 1914, brought about an interruption in the reforms then in hand.

Mobilization and Marksmen.

Thanks to the mobilization, which has lasted for months and not days, the Swiss Army has been able to complete its higher military training and preparations for war, *inter alia*, a new rifle has been issued to the troops. In 1914, the Swiss soldier was no more than a militiaman, to-day he is a professional expert. Musketry practice has received due attention during this period, and much improvement is noticed in the marksmanship of the individual soldier, though much still requires to be done. The necessity for the introduction of measures for the *resolute adaptation of range practice to the new conditions of a modern war* still exist.

Refresher Courses.

Selection of Marksmen. Proposed Reforms.

Target practice is included in Refresher Courses and the question is how best such courses can be utilized. One suggestion is that the trained soldier should on such occasions be put through musketry training from the beginning for the following two reasons:—

(*a*). Owing to the incomplete nature of the musketry training during the recruit course.

(*b*). The necessity for the soldier to learn the technical details of his new rifle and to acquire skill in handling it with ease.

All soldiers should be made to fire an individual practice course at bull's eye targets; those proving themselves good shots should at once be passed into the First Class, for training in field practice. Those who fail to reach a suitable standard should be put into the Second Class or made to go through aiming drill, etc., again. Those who are proved to be hopeless failures at range practice should be combed out of the ranks of fighting units and turned over to non-combatant duties; they should be made to carry a stretcher, a pick and shovel, indeed any other implement except a rifle. It is no use lumbering up the infantry with *useless mouths*; men who have insufficient confidence in themselves. War is becoming more and more a *specialized calling*, let this fact be recognized and let armies be organized accordingly.

Training of Rifle Shots. Taste for Rifle Shooting.

The training in musketry is incomplete, unless it results in creating a passion for rifle-shooting, a *sine qua non* if a man is to acquire the highest degree of skill. To create this passion badges, prizes, etc., should be offered to stimulate and encourage the soldier.

The Chiefs as Rifle Shots.

"Example is the best of lessons."

Every instructor, that is to say, every officer and N.C.O., should be in a position to claim that he can turn a trained soldier into a first-class shot. However, those only who have a passion for rifle shooting and devote themselves to the pastime assiduously will be able to inspire in their pupils that taste for rifle-shooting which can alone make them into marksmen. It is thought that much is required to improve matters in this respect in Switzerland; the officers do not sufficiently show their faith in the maxim: Example is better than precept.

Non-Commissioned Officers.

What has been said above with reference to officers applies equally to the non-commissioned officers. The non-commissioned ranks would be the first to gain by an increase in confidence on the part of the men in their superiors.

The Object to be Attained.

After completing a course of elementary target practice, the soldiers who have reached the minimum standard should next take part in individual field practices, under active conditions, at disappearing targets at unknown ranges. This second stage in the musketry training of the soldier is by far the most important and forms the most difficult part of his education. The object of this stage in his training is not only to make rifle shooting a second nature, but also to develop initiative, to foster self-confidence, to teach control of nerve-power, in a word, to put the soldier in a position to deal with any situation with which he may be faced on the battlefield.

The writer of the *Revue* article claims that he is an out-and-out partisan of the school which advocates deliberate and slow-aimed fire, but he recognizes that situations do arise which it would be dangerous to ignore; one of these is that which renders rapid fire on a battlefield an absolute necessity. There is much evidence to support this view. This being the case, there is only one satisfactory way to meet the situation and that is by so training the soldier that he will be able to deal with it effectually whenever the occasion arises. The standard fixed by Major d'André is one requiring the soldier to obtain at least three hits a minute on a disappearing figure target; he urges that a soldier should not be dismissed musketry until he has reached this standard. It is only when a man surpasses this standard that he can be considered a "battlefield marksman."

Automatic and Repeater Rifles.

"Clever soldiers do not await events, they anticipate them."

In the spring of 1915 Major d'André predicted that the soldier would shortly have an automatic rifle placed in his hands; then would begin the era of *tireurs d'élite*. Two Austrian inventors, Visni and Fuchs, are said to have invented a device which allows of the conversion of ordinary rifles into automatic rifles at a trifling cost in a very few hours. It is reported that the Germans immediately took advantage of this invention; they are said to have also adopted a Browning type of automatic rifle (discharging 10 bullets consecutively without reloading). It is rumoured that the new German regulations provide for every 25 yards of fire trench being held by two machine guns and 30 automatic rifles. The Germans are also said to be using a repeating rifle of the Danish Madsen model, weighing 16½ lbs. and capable of firing 250 rounds per minute.

The French and the British, it is stated, have also adopted repeating rifles. It is urged that Switzerland should not be blind to these developments, but should take time by the forelock. He who does not advance with the times is left hopelessly behind. No question arises, says the writer of the *Revue* article, of Switzerland attempting to compete in the

matter of "giant artillery" with her northern and western neighbours; however, in the matter of infantry armament there is no reason why the Republic should not be ahead of her neighbours. It is urged that the crack shots of the Swiss Army should be armed with automatic and repeater rifles and so organized as to enable the best use to be made of these weapons on the battlefield. There will be opponents to this as to every new idea. Meet them, he says, by sweeping away *sacrosainte routine*.

The Swiss Rifle.

It would be a mistake, in the opinion of the writer of the *Revue* article, to arm the whole of the Swiss infantry with automatic rifles at present; it is still necessary to carry out experiments to determine the real military value of such an armament. Moreover, it is only very recently that a rifle on a new model was served out to the Swiss Army; it is an excellent piece of mechanism and in good hands will always be capable of producing excellent results. It is claimed that the new Swiss rifle and the ammunition for it are the best in the world.

Voluntary Rifle Practice and Rifle Shooting for Sport.

> "Do not then, ye sons, allow your carbines to rust. Cherish them as did your forbears their halberds."

The Swiss authorities in 1915 suppressed all "compulsory rifle practices," and recently the Federal Council decided not to revive these rifle practices at all events in the current year. It has also been found necessary to prohibit the issue of ammunition to the rifle clubs; this decision of the Government has almost completely paralyzed these institutions. The consumption of munitions has been very great in the present war; so much so indeed as to cause the Powers, who have not yet been swept into the maelstrom, to be anxious to husband their resources and to increase their stocks of ammunition to meet any eventuality which may arise. This accounts for the attitude taken up towards the rifle clubs by the Swiss Government. It is urged that it would be imprudent for the Federal Council, under the pretext of effecting economies, to discourage voluntary rifle practice, one of the principal factors of Swiss national strength. The authorities are reminded that an old proverb says: Every cartridge fired in times of peace results in two being saved in time of war.

What is wanted in Switzerland is not, it is said, the suppression of voluntary rifle practice, but its reform in order to adapt it to the requirements of the battlefield. The writer of the *Revue* article says that he is an ardent believer in rifle shooting for sport; he is of opinion that even this form of rifle shooting could be taken advantage of for the purposes of training the Army.

Targets.

It is stated that the types of target now in use in Switzerland are obsolete and should be replaced as early as possible with targets suitable for field practices. It is urged that the present is an opportune moment for effecting the change, as the introduction of new types of ammunition has made the reconstruction of ranges a necessity.

The Young Rifle Shots.

> "A people that knows how to raise the souls of its youth to meet the exigencies of war has accomplished the most important and most difficult of the tasks imposed by the requirements of national defence."

The Swiss Government has left to the initiative of the rifle clubs the important task of training the young rifle shots. The writer of the *Revue* article is of opinion that although some good results have been obtained yet much more requires to be done before the situation can be considered satisfactory; the training of the youth of the Republic for military service has, in his opinion, become an imperious necessity. The belligerents on the Swiss borders have enrolled all their young men, and mere children are in some cases filling the voids caused by the struggle in the ranks of the belligerent armies; the experiences through which these children are now passing, it is thought, will breed in them a bellicose spirit, an excess of Chauvinism. Thus it becomes necessary that the present generation of Swiss children should be brought up in such a manner as to be in a position to face the worst that may come. It is recommended that, *inter alia*, courses of rifle practice should be specially organized for Swiss lads and attendance thereat should be made compulsory for all young fellows between 16 and 20 years of age.

Conclusion.

The writer of the *Revue* article feels that there are many who will oppose his views. Nothing, he says, will give him greater pleasure than to see the matters discussed by him thoroughly ventilated in the public press. He recalls the incident in the French Chamber just prior to the Franco-German War of 1870 when Marshal Niel was introducing his scheme of Army Reform. A deputy rudely interrupted the Marshal with the question: "Do you wish then to convert France into immense barracks?" "Take care," retorted the old soldier gravely, "that it is not turned into a graveyard." Those who are hostile to the development of the Swiss Army are asked to meditate upon these words.

A Few Notes on Musketry Instruction.

It is pointed out in the *Revue* article that the whole world had for some time past fully realized that the advances which had been made in the technical matters connected with armies would profoundly modify the character of war as known to older generations. The Powers have in recent years been ready to adopt the smallest improvements in arms or military stores and equipment promising any advantage however small. For example, Switzerland has spent hundreds of thousands of pounds for the purpose of obtaining a firearm with a flatter trajectory and providing greater penetrative power than that possessed by other Powers. Recently, a new weapon has been placed in the hands of the Swiss soldier which, when fired from a rest, is capable of planting every shot, aimed at a target at 300 yards range, into an area less than the size of a man's hand. However, the standard of skill demanded from a soldier is such that six consecutive shots fired by him at a range of 300 yards will obtain hits on a target such that their average distance from the centre of the bull's eye does not exceed 19½ in.

This standard shows a marked disproportion between the accuracy of which the weapon is capable and the skill required from those who handle it. The opinion is expressed that the standard fixed is not high enough.

It is urged that it should be impressed on recruits from the beginning of their instruction that what is required from them is "fire intended to kill" and not "fire intended to frighten" the enemy. For aiming drill a figure having, as viewed from the firer's position, the apparent size of a man's head at a range of 300 yards should be used as a target. It is important that in the early stages of musketry training all efforts should be directed to secure that a recruit shoots correctly for elevation; at first, it is not so important to consider the question of accuracy for direction. The latter point can be attended to later, when the recruit has mastered the difficulty of holding his rifle properly so as never to miss placing his shots between two horizontal lines at the desired vertical distance apart.

The writer of the *Revue* article suggests that the method of classification now in use in connection with the musketry training of the Swiss Army requires to be completely changed. "Cones" of fire should never, in his opinion, be referred to in the presence of soldiers, who should not be encouraged to contemplate the use of collective fire; they should alone be concerned with the result produced by each individual shot fired.

The principal faults made by bad shots in using their rifles are the same the world over, viz., aiming with either too full or too fine a sight, holding the rifle with sights inclined out of the vertical, and jerking at the trigger; of these the last mentioned is the one most difficult to cure. It is suggested that the recruit may be cured of this fault if he can be made to press the butt of his rifle well into the shoulder in the manner prescribed by the regulations, a matter which is rarely attended to.

INFORMATION.

Switzerland.—An extract from Army Orders published on the 22nd April, 1916, authorizing the Swiss troops to fire on foriegn aircraft on receiving orders to do so either from an officer or an N.C.O. is given in the *Revue*.

A copy of an order issued by the Adjutant-General on the 28th April, 1916, relating to the presence of travelling photographers in barracks and camps is reproduced. Attention is drawn to the fact that some of these itinerants are undesirables and should be excluded from camps, etc.

The death is announced of Lieut.-Colonel Paul Guignard.

W. A. J. O'MEARA.

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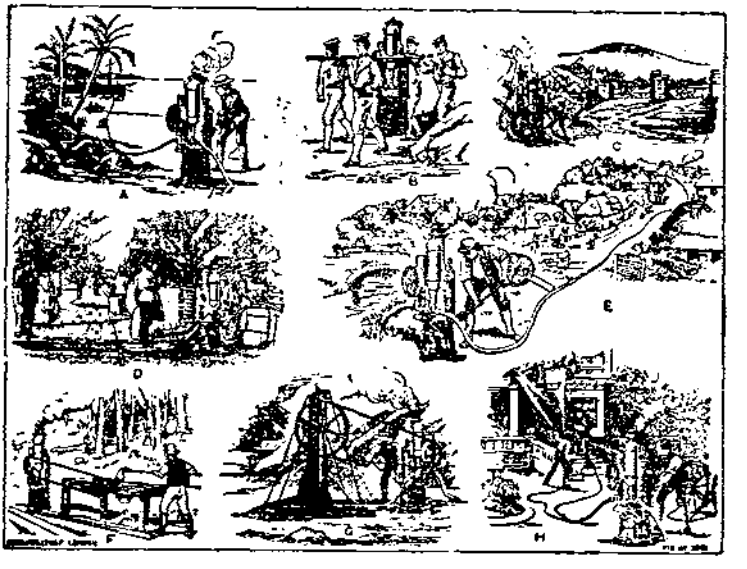

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