

CHAPTER II

TRENCH WARFARE—GENERAL OUTLINE

IT is a truism that, over long periods of history, the scales of battle have been evenly balanced between arms and armour—using the words in their widest possible sense to imply every form of attack and defence—for otherwise warfare could not exist. Yet there have been times when some mechanical invention, by tipping the beam in favour of one or other, has profoundly modified the whole character of military operations. The discovery of gunpowder which dealt the *coup-de-grâce* to the armoured knight is an instance that will readily occur to the mind; while the invention of the bayonet, which completely established the pre-eminence of infantry as the chief fighting arm, was hardly less important.

The World War, although it was realized only dimly, if at all, occurred at just such a period when the magazine rifle, and still more the machine gun, had imparted to the defence a marked superiority over the attack. A comparatively thin line of entrenched infantry, itself immune from shrapnel and bullets and protected from assault by barbed wire, was able to pour out such a deadly stream of accurately directed fire as to make direct onslaught, even by a far larger body of adversaries, too costly to be attempted until the defence had been largely annihilated by extraneous means.

All the efforts of military science were therefore at once concentrated on restoring that balance without which the supreme aim in warfare—the concentration of a superior force at a vital point—was of no avail. The engineer and chemist vied in producing giant howitzers and mortars to search out and pulverize trenches with high explosives; aeroplanes to discover and bomb hidden defences; cylinders and projectiles to emit poison gas and stifle resistance; armoured tanks, invulnerable to bullets, to sweep away obstacles and attack at

close quarters; besides grenades and a host of minor appliances.

But Science holds a two-edged sword which can be used for defence as well as offence. Single lines of trenches gave way in favour of resistance organized in depth, with labyrinths of wire entanglements and related machine gun posts that had to be overcome before numerical strength was encountered; gun fought gun, aeroplane aeroplane, anti-tank guns and delay action mines attempted to destroy tanks, means of protecting the soldier from gas and shell splinters were discovered, pictorial art came to the aid of concealment; and so the duel went on with the scales still loaded in favour of defence.

It may be noted in passing that the search for equality still continues. The mechanization of our army is simply a further attempt to increase the power and immunity of the attack; and, should this gain the upper hand, new mechanical means of defence will doubtless be exploited. Thus warfare ever becomes more and more a matter of materiel and engineering and less and less a matter of thews and sinews.

In pursuit of these objects the entire populations of the nations engaged were drawn into the maelstrom, and to a great extent those of neutral countries. Not only did the making of munitions become a great State industry, but for four bloody and ruinous years, during which we raised recruits by the million, there was an unparalleled drain of almost every commodity, domestic as well as military. In warfare efficiency alone counts, economy has to go to the wall and materiel as well as lives must be prodigally expended. Every man and woman, every kind of raw material, every manufacturing process was placed under contribution; and the war became one of attrition, where victory depended upon which side could first exhaust the physical resources, man-power and moral fibre of the other.

The Germanic Powers, acting on interior lines, had the advantage of being able rapidly to transfer men and munitions from one front to another, but in other ways

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these conditions favoured the Allies. Having the command of the sea, we swept the enemy's flag from the surface of the ocean, and had the markets of the world at our disposal. We proclaimed the whole of the North Sea a blockaded area and did our utmost to prevent not only contraband of war but supplies of every sort from reaching Germany. Germany retaliated by attempting to stop all shipping from reaching the Allies by means of under-sea boats. The submarine's only chance of safety lay in staying concealed under water where it could distinguish neither the nationality nor the type of craft it was attacking; and a more ruthless form of warfare, one more abhorrent to the usages of civilized nations, it is impossible to conceive. Neither liners nor hospital ships were exempt and their crews and passengers were abandoned to their fate. At one time it almost looked as if we might be starved into surrender, but means were discovered of combating this formidable marine weapon and the ultimate result of this ruthlessness was to drive America, the only great Power so far neutral, into the struggle on the side of the Allies.

Over and above these factors of modern warfare, however, there were special reasons why materiel should be so particularly essential on the main front in France and Flanders. For close on four years following the battle of the Marne, which put an end to open warfare, there was never a great victory evolved by military genius and carried to a decision by brilliant generalship. Stretching from the North Sea to the neutral territory of Switzerland were, by mid-winter 1914-15, continuous lines of trenches; and, with no flanks to be turned, there was little opening for strategy. The only hope of accomplishment lay in frontal attack and the actual destruction of the opposing force, which was impossible without overwhelming supplies of munitions.

In the intense and prolonged operations, whose object was to break through the enemy's defences, millions of men were employed and millions of shell expended. Yet, although the attack had the advantage of being able to select its own battle-ground and make all its

preparations in advance and in secret, the strength of a well-organized defence was such that in no case did these attempts on either side succeed in effecting more than the capture of some point of tactical advantage at a sacrifice of life out of all proportion to the objective gained.

Perhaps Tanks, a British invention, might have been more successful had they been used in sufficient numbers. The Battle of Cambrai in the autumn of 1917, where for the first time they had a chance of proving their mettle, was certainly an exception. As far as it went this was an unqualified success. But the scale was small, the winter fast approaching, the advantage not exploited, and a few days later all our gains were converted into losses.

A far nearer approach to some decisive result occurred in the spring of 1918 when the defection of Russia gave Germany a great superiority on the western front. The stupendous series of offensives which she then launched did succeed in penetrating deeply. But here once more the dominating influence of materiel can be traced. A chief reason why these attacks came to a standstill was that it proved impossible for supplies to keep pace with the advance of the troops.

Although hailed by Germany as great victories and regarded with dismay by the Allies, these operations led nowhere and proved the final undoing of Germany. The morale of her people, who had been taught to expect great results, was undermined. The formidable Hindenburg Line was smashed in a great British attack led by tanks. Leadership once more had play and the Allies under Foch and Haig advanced from one victory to another. A steady and continuous pressure, combined with the defeat of Turkey in Syria, the capitulation of Bulgaria and the collapse of Austria, caused Germany to sue for peace.

Throughout the long years of trench warfare strategy had been paralyzed. The dream of victory by means of massed men and massed guns invariably turned into a nightmare, and in the end it was the psychological factor

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rather than the physical which brought the World War to a close.

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It will be readily grasped, even from this brief survey, that the Quartermaster General's branch of the staff, which had to meet the manifold needs of our armies and distribute among them the twenty-five and a half million tons of materials landed in France by the time of the Armistice¹, played a far more predominant rôle than in any previous conflict; and among Q.M.G. services there was none where development was so marked as in those administered by the Army Ordnance Corps which, with few exceptions, had to supply and maintain in a state of efficiency the vast array of paraphernalia that the General Staff summoned to its aid, and to arm, clothe and equip the great armies that we called into existence. Of the orders issued by the Q.M.G. staff 70 per cent dealt with Ordnance subjects.

The materials that absorbed the energies of the Corps can be divided into three main groups; those intended to destroy or demoralize the foe, those designed to counter his similar attempts, and those needed to keep the troops in health and spirits during their abnormal life in the trenches.

These are subjects the fringe of which can only be touched; to describe in any detail the new types of gun and ammunition would alone occupy a bulky volume. But some brief mention of matters that so vitally affected the work of the Ordnance must be attempted, and this can best be done by giving typical examples.

Of these by far the most important was the immense development of heavy artillery. The armament of our Expeditionary Force in the autumn of 1914 comprised the following:

13-pr. Guns	30
18-pr. Guns	324
4.5 Howitzers	108
60-pr. Guns	24

¹ They are given by categories in Appendix I.

THE WESTERN FRONT

By 1918 the figures for ten times as many divisions were:

<i>Guns</i>		<i>Howitzers</i>	
6-pr.	766	4.5-inch	984
12-pr.	10	6-inch	1046
13-pr.	310	8-inch	240
3-inch	106	9.2-inch	224
18-pr.	3215	12-inch	66
60-pr.	456	15-inch	6
6-inch	152		
9.2-inch	16		
12-inch	4		
14-inch	2		
		<i>Mortars</i>	
		Of various types	3022

A number of the larger species of gun and howitzer were on railway mountings.

This mass of artillery consumed ammunition on a scale which beggars adjectives. During the last three months of 1914, shipments overseas amounted to 7131 tons; at the time of the Armistice there had been landed in France well over five million tons, and during the operations at Passchendaele, in the autumn of 1917, the expenditure amounted to 465,000 tons valued at £84,000,000. The amount expended in our South African campaign was in its time without precedent; but now the weight of metal fired in a day might exceed the whole of what was consumed in the thirty months' duration of the war in South Africa.

Besides the Vickers machine gun the Lewis, far lighter, was introduced for infantry and the Hotchkiss for cavalry. In 1914 the arrival in France of a dozen machine guns was an event to be heralded, in the Somme battle the casualties alone amounted to 2889. The anti-aircraft gun was another novelty, and machine guns were fitted with special mounts and sights to tackle low flying planes.

Although the Air Force and Tank Corps provided their own technical equipment, the Ordnance had to supply aircraft bombs, keep tank guns in order and supply all ordinary clothing and equipment for both Corps.

The earliest trench missiles of 1914 were improvised, ironworks situated in the industrial area we occupied

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proving very useful for casting mortars and bombs. At that time the Corps was quite inadequately represented at the front, but fortunately there were companies of Royal Engineers present to help, though many of the extemporized products were almost as dangerous to friend as to foe. It may be noted in passing that the first demand for anything of this sort made on the Ordnance was for a quantity of elastic to make catapults. Afterwards mortars and bombs were made in the Ordnance base workshops and many experimental types provided from home; the day being eventually won by the Stokes mortar, which combined simplicity, speed of fire and reasonable safety.

In March 1915, 48 Mills grenades were sent out for trial, and so successful was this type, that it became the standard, both for throwing by hand and for discharge from a rifle fitted with a cup. Many other sorts however remained in use, and grenades were expended by the million.

There were specially accurate rifles fitted with telescopic sights for snipers, others of high power to smash loop-holed plates, and shot guns to deal with carrier-pigeons that fell under suspicion. Periscopes were of many patterns, both of plain glass and prismatic; and high-powered telescopes were used at selected observation posts.

When attacks were in preparation, there would be great concentrations of special battle stores in the projected zone of operations; tens of thousands of wire-cutters and of wire-breakers that were fastened to the muzzle of the rifle; thousands of flares and daylight signals or panels to be stretched on the ground for signalling to aircraft during an advance, smoke candles to give off a concealing cloud should the wind be favourable.¹ To carry forward grenades, bombs, rations, etc.,

¹ The importance attached to even the most trivial of these adventitious aids is exemplified by the following tale.

On the eve of the battle of the Somme General Rawlinson called to see the Quartermaster General and expressed his anxiety because a particular flare had not reached his Army. I was sent for to explain the situation

in the attack, Yukon packs and tumplines were introduced by Canadian troops—popular in some divisions, but not in others who preferred canvas bags and buckets or special waistcoats fitted with pockets. Pack-saddlery would be in great demand at these times and canvas gun-ammunition carriers to be placed over riding saddles; for wheeled transport could not traverse the shell-pitted ground gained in an advance.

A few only of the most important new adjuncts for offence have been here enumerated; there were many that were passing fads, no sooner tried than discarded. The type of warfare was so novel that no suggestion could be ignored so long as it seemed practical; it was impossible to say what might not prove of use without trial. In the summer of 1915 no raid could take place without daggers, and the base Ordnance workshops were kept busy making stabbing knives by the thousand. But the British soldier did not take kindly to such a treacherous weapon and the next fashion was the knob-kerry, a truncheon studded with frost-nails for horse-shoes. The most expensive failure was the Lewis gun hand-cart. The General Staff looked on the provision of these for the Somme battle as a matter of the utmost importance, and they were rushed out from home just in time to take part in the attack without preliminary trial. No sooner were the carts issued than every regiment promptly discarded them, the loaded weight being more

which was as follows:—Being unable to get any definite news of their arrival, an officer of the R.F.C. had flown to England to make enquiries from the Ministry of Munitions. The official who dealt with this branch of work expressed his surprise, saying he knew of no hitch and believed they had been delivered; but he promised to make enquiries and give a definite answer the next morning. When the officer returned the following day he found the individual he was to interview had been conscripted in the interval! He then went to the War Office and, in view of the urgency, managed to obtain his instant release. All this trouble however was to no purpose. A special chemical ingredient required to produce a particular colour had, it seemed, been wrongfully used and a further supply was not to be had. The operations had to take place without this flare which was only one among a number composed of different coloured lights, the rest of which had arrived safely in France.

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than the gun-team could drag. This experiment cost half a million sterling and earned a mild reproof from the War Office.

Turning next to measures of defence, the greatest novelty, and that which most affected the work of the Corps, originated in the German gas attack of April 1915. This affront to civilization caused consternation, and instant means of protection had to be found. The earlier respirators or smoke helmets required frequent chemical treatment, involving the installation of a novel type of Ordnance establishment on the lines of communication. New and more effective types continually appeared, besides which there were other appliances to be furnished, horse helmets and covers for carrier-pigeon baskets, spraying apparatus and fans to drive away gas, strombos horns and rattles to give warning of an attack, and vacuum bulbs to catch samples for testing when it occurred. Special clothing had to be provided when mustard gas came into use, and fireproof clothes as a protection from flammenwerfer. Moreover measures of retaliation led to the introduction of a whole range of new projectiles filled with chemicals—lethal and lachrymatory.

Of equal importance with the gas mask as a life-saving device was the steel helmet first tried in 1915, every man at the front being provided with helmet and respirator as soon as enough were forthcoming. Body armour was also worn in trench raids and Japanese necklets made of silk were even tried.

Camouflage, another new service, involved the provision of immense quantities of paint and canvas, the painting of guns in stripes and blotches, the staining of tents with kutch and the supply of black or white overalls for raids in the dark or snow.

Among miscellaneous items may be mentioned gloves for handling barbed wire, covers to protect the breech-mechanism of the rifle from mud, ear-drum protectors for gunners, trench stretchers, and electric torches—the consumption of which was enormous for they were extremely handy, not only at the immediate front but in

areas further back where no exposed light was permissible. There were, besides, wagons to be fitted up as portable carrier-pigeon lofts, and bombs to carry messages fired either from mortars or by a rocket apparatus.

In 1914 our artillery alone, besides the Signal Corps, had a small telephone outfit, but infantry were soon afterwards provided for and no sooner did warfare become stationary than the whole front began to be covered with an ever-increasing network of lines. In fact the supply of cable and telephones never overtook the demand, and the plan was eventually adopted of allotting what arrived to Armies who in turn had to distribute to the best advantage. The Signal Corps experimented with numberless new types of apparatus and wireless, the work of supplying which was helped by the establishment, alongside the Ordnance base depot, of a Signal Park which distributed this very special equipment to its own units.

Except for ammunition, no category of commodities approached in bulk to sandbags. These, with barbed wire, spades and shovels, were in great request immediately warfare became stationary, being sent in the autumn of 1914 to Boulogne with ammunition and distributed from ammunition railheads. But soon afterwards advanced R.E. Parks were formed to hold stock of trench materials in forward areas, to which they were consigned instead. Demands for sandbags increased by leaps and bounds and, to supplement supplies from home, large contracts were placed in France. It was thought at the time that a feat had been accomplished when a firm of sack-makers at Flixecourt undertook to furnish 30,000 a day; later on the consumption was at the rate of a million in 24 hours, and on one occasion, in 1916, 10 million were sent to the front in four days.¹

¹ Without intending for one moment to belittle the invaluable work of the women of England when directed into proper channels, it must be owned that private gifts of sandbags and other articles addressed to individuals or regiments became a positive burden to handle in France. Eventually an order had to be published forbidding applications from being sent home. The following report of a battalion commander, supplies the clue:

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The third category of commodities for which there was an increasing demand as the war dragged on its weary course comprised those concerned with welfare. Although, owing to the care given to sanitation and prophylactics, there was no great scourge of disease such as has usually accompanied warfare in the past, the percentage of wounded was high. Innumerable hospitals, casualty clearing stations, ambulance trains, hospital ships and barges, and convalescent institutions were equipped with every modern convenience.

By degrees also many of the amenities of a civilized city came into existence to mitigate the hardships of life in the trenches—clubs, rest houses, entertainment halls, cinemas, canteens, and schools of instruction, besides laundries, baths and even soda-water factories. Some of these were self-supporting; but numerous others were furnished by the Ordnance, mainly from articles made in its own workshops. In addition large auxiliary armies of British women, labour both white and coloured and prisoners of war had to be accommodated and clothed, each type under its own special scale.

Winter clothing, blankets and horse-rugs had to be

“ I do not see how it is possible to prevent men writing home to their own friends and asking for socks and shirts. That is a private matter which does not concern a Commanding Officer. This is my second winter in France, and I have no hesitation in saying that the promiscuous distribution of comforts, in the way of clothing, to the troops from irresponsible people at home, is nothing more or less than a nuisance to a Commanding Officer. I have never found any difficulty in getting sufficient shirts or socks for my men from the proper source.

In my opinion a good deal of the complaints come from men who want to give the impression that they are suffering untold hardships. The forms issued by ‘ Queen Mary’s Guild ’ are in themselves a danger. There are many Commanding Officers who find themselves unable to resist the temptation of saying they want shirts and socks, if it is a matter of filling up a form. They do not pause to consider what they are going to do with them when they arrive. I frequently get parcels of shirts and socks sent from various charitable institutions; in acknowledging them the tendency is to say that they were greatly appreciated by the men, one might go so far as to say they were badly needed in order to appear grateful. This gives rise to the impression that the War Office are guilty of neglect. In reality one would like to say that they were an incubus and not required.”

stored and renovated during the summer months—great-coats, fur-waistcoats and leather jerkins, sheepskin-lined coats for some, mackintoshes for others, fingerless and woollen gloves, thigh gum-boots for the trenches and short gum-boots or field boots for muddy horse-lines.

At the time when our retreat was stayed on the Marne, the Commander-in-Chief had wired home asking for a supply of clothing for officers, many of whom had lost their kit and were in rags ; and some hundreds of jackets, caps, shirts, etc., of officers' patterns were hastily purchased and sent out. This new development proved most popular ; by degrees every requisite that an officer might need was stocked for sale at officers' shops.

An important improvement, first tried in the autumn of 1916, consisted in the addition of a collar and flap to the rectangular ground sheet, converting it into a very serviceable waterproof cape of the pattern now in use.

Among miscellaneous items may be mentioned disinfectors for de-lousing clothing, primus stoves and hot-food containers for exposed situations where a fire could not be lit, navvies' foot-plates to save the boot in digging, fly-traps and mosquito curtains ; and, for the horse, chaff-cutters, corn-crushers and forges—for cold shoeing, the only method contemplated in war, proved unsatisfactory.

Further, all this gear needed extra transport, each division being given a train of blanket wagons ; and as horses were none too plentiful they were reinforced by thousands of bicycles.

The war, so far as concerns the supply of materials, can be divided into two phases, each with its own features. The first, which roughly speaking lasted till the end of 1915, was a period when man-power was plentiful and munitions scarce. In the second there was an abundance of munitions but a constantly increasing scarcity of man-power and a shortage of shipping that gave rise to very great anxiety.

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During the first of these two epochs, when the strength of our forces in France rose from 160,000 to a million and was accompanied by an enormous expansion of artillery, there was the gravest difficulty in furnishing every species of technical equipment. The more domestic class of commodity provided by the D.E.O.S. under the Quartermaster General at the War Office poured out to France with the most wonderful regularity; despite the constantly increasing demand it was rarely that there was any shortage, even temporary.

But guns, ammunition, machine-guns and rifles, provided by the Master General of Ordnance, were far more difficult to get. Before work could begin on a greatly extended scale munition factories had to be built, machinery made and hands trained; and even then, with the constant cry for more artillery, work at home was concentrated on the production of new batteries rather than on the making of the spare parts and adjuncts needed to keep them in action and replace breakage; which moreover did not figure in the statistics of output on which munition factories prided themselves. Batteries would arrive without even the implements to set their fuzes; and our workshops, besides their legitimate work, had perforce to manufacture on a large scale every kind of gun-fitting. To this the War Office took exception, fearing that damage might result; but the Commander-in-Chief's retort was obvious, that this action on the part of the Ordnance had enabled hundreds of guns to keep their place in the line without any accident resulting. To this argument there was no possible reply but to acquiesce and promise to try and speed up supply from home.

But the wastage was extremely heavy, and although supply in time improved, there was never a plethora; the inevitable result being that batteries illicitly hoarded articles such as dial-sights which they knew might be difficult to replace at a moment's notice. The Ordnance was always between the horns of a dilemma in such matters; an overplentiful supply led to wastefulness, while stringency encouraged miserly habits.

Far more serious was the shortage of gun ammunition during 1915, for here self-help was out of the question. The expenditure of every single round had to be checked, and there was no option but to be niggardly and hoard the very scanty stock.

A matter of serious concern to Lord Kitchener was whether the departure of his newly raised Armies might not be delayed for want of rifles, rumours reaching him that they were being used to make dug-outs; and, although denied officially, it is beyond question that Kitchener was in the right. Every reinforcement arrived at the front armed, and the rifles of casualties, that should have been returned to the base, were apt to be scandalously misused, even to the extent of being employed as flooring for trenches.¹ Rifles were so hard to come by that they had to be largely withdrawn from troops other than infantry and cavalry at the front and supplemented by an inferior type without cut-off got from America; while quantities of .256 rifles and ammunition were imported from Japan for the Home Defence Army. Finally, at the urgent solicitation of the War Office, the Commander-in-Chief was reluctantly compelled to agree to accept unarmed drafts, pools of rifles being formed in France for issue to reinforcement camps. It was not till the end of 1916 that supply really overtook demand.

However our troops never actually suffered from the want of rifles. The shortage of machine guns (there were but two per battalion) was what really mattered. In December 1914, when it was decided to double the scale, the stock in France amounted to 23; and it was long before effect could be given even to this modest demand, which was very far from representing finality. Germany alone had realized the immense power of the

¹ Such slackness was there at this period in salvaging materials, even of such primary importance as arms, that, when it was decided to re-arm the 1st Canadian Division with our service rifle, the number asked for was comparatively negligible. The Ross rifle with which the Canadians were armed, though excellent as a match weapon, was not fit for the rough work of trench warfare; the men had lost confidence in it and most had already managed by hook or by crook to re-arm themselves.

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light automatic weapon with which our troops were in comparison so sparsely provided; and in the first years of the war we were as grievously handicapped by being unable to reply to the stream of bullets poured forth from the enemy's machine gun emplacements as in being unable to retaliate when his artillery shelled our trenches.

By 1916 initial difficulties in the making of munitions were being overcome and an altogether fresh set of problems had to be faced.

Ammunition began to pour into France in such volume that the difficulty was to know where to put it; to stop the flow would have checked manufacture and vast stocks had to be accumulated in preparation for attacks. High explosive shell and bombs had never before been held in any quantity, early designs of ammunition depots proved to be dangerously constructed when subject to air raid, and numerous fresh ones had to be built spread over immense tracts of ground. The types of new ammunition were many, and their fillings subject to deterioration. Constant examinations of stock were necessary owing to defects discovered in what had been made at some one or other munition factory during some particular period, or from some particular batch of ingredients.

Guns, also now more plentiful, were beginning to show signs of wear and records of their probable lives were required so that programmes of replacement might be framed well in advance.

This plenitude of munitions coincided with a shrinkage of man-power. Every fit man who could be spared was wanted at the front and the Corps was shorn of much of its best materials, its ranks being filled by disabled soldiers and weaklings and reinforced by the Women's Auxiliary Army Corps, thus adding to its difficulties.

Towards the close of 1916, at the time when the seasonal beet traffic was at its height, the overworked French railways in our area were on the verge of a breakdown that threatened to end in complete paralysis, for trouble of this sort accumulates with intense rapidity. An even more serious matter, though one perhaps not so instantly

pressing at that actual moment, was the continual loss of shipping from the activity of enemy submarines. It was useless to have the world's markets at our disposal if we had neither the ships to bring their produce home nor the railways to carry them in France.

This deficiency reacted in other ways; it delayed the discharge of ships, and resulted in the accumulation at ports in France of many tens of thousands of tons of gun cartridge-cases and packages badly wanted by munition factories for refilling. In fact traffic of all sorts threatened to come to a standstill unless prompt remedies were applied.

To cope with this problem Sir Eric Geddes, a great railway organizer, was sent out to inaugurate a Directorate of Transportation, which was not only a Directorate but a fourth branch of the staff, relieving the Q.M.G. and I.G.C. of all work in connection with shipping, ports, docks, rail and waterways.¹ From this time onwards strenuous endeavours were made to create new base depots inland; and although these schemes had not all matured by the end of the war, they resulted in the evacuation of very valuable Ordnance premises in the docks, so as to speed up transit work and enable ships to be turned round with the utmost despatch. This resulted in new arrangements for clearing cargo; very intricate programmes of tonnage had to be prepared both for sea and inland transport, and at periodical conferences held at G.H.Q., the Director General of Transportation, in conjunction with Q.M.G., G.S. and the Directorates concerned, would decide how such ships, railway trucks and barges as were available should be allotted between

¹ It would have been more logical to make the new Directorate responsible for *all* transportation, including carriage by road; but this would have entailed an immense upheaval of our existing arrangements. To constitute it a fourth branch of the Staff, however, independent of the Quartermaster General, was I believe a mistake. While the arrangement worked well enough so long as the deadlock continued, it broke down under the stress of the great German attack of 1918. From the spring of that year onwards the Q.M.G. became once more responsible for all transportation services.

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stores and clothing, ammunition, food, road and building materials, etc.

The constantly increasing scarcity of shipping and man-power combined to bring the conservation of materials very prominently to the fore, the urgency of the problem being accentuated by the insatiable demands for materials of all sorts in trench warfare, the world-wide shortage of all primary products and enormous losses caused by submarine attacks. This was a business for which the A.O.C. was responsible during peace, when regimental economy depended on checks applied by the administrative departments of the army. But with the advent of war, the customary checks perforce went to the winds, a unit had only to certify that the clothing or equipment indented for was needed to replace wastage, to receive practically any quantity it might choose to demand ; and this was a certificate most officers would put their names to with a very light heart. In our small and well cared for voluntary army the regiment had small occasion to study the bitter lesson of economy, it was nurtured by others ; and now that this outside restraining influence was withdrawn and our army composed so largely of temporary soldiers who had first to learn to use their weapons and how to fight, it is not surprising that gross extravagance was apt to prevail. Responsibility for economy now fell in fact on the shoulders of the consumer, in the prevention of waste regimentally ; though divers rough and ready checks were adopted to enable the Ordnance to curb extravagant demands.

Of equal importance was the gleaning of derelict materials on the battlefield or from abandoned camps and billets. According to our War Manual the clearing of the battlefield was the duty of the Adjutant General's branch of the staff, but the instruction was really intended to apply to the succour of the wounded and burial of the dead. When the salvage of materials became so important, it was naturally on the Q.M.G. staff that the duty fell ; and a new organization was brought into being, with a Controller of Salvage at G.H.Q. who, in conjunction with a similar official at home, dealt with

general questions of policy, and a small nucleus crew with each formation to supervise the gleaning.

One reason for creating this new establishment was that salvage covered every species of material, another that the regimental officers and men who were employed received a lower rate of pay than those of the A.O.C. ; but in reality the policy was penny wise and pound foolish, seeing that existing organizations only needed expansion to deal with the harvest. Probably 90 per cent of what was worth retrieving comprised Ordnance stores and ammunition, and it would have been better to entrust their collection to the D.O.S. In practice it proved impossible to cut Ordnance representatives at the front adrift from the work, especially when it came to dealing with ammunition. It was they who were the experts and into whose hands what was collected had eventually to come ; and it was they who, from their records of what had been issued, could tell where waste was occurring. The result of setting up this independent organization was never satisfactory ; it created a divided responsibility. Hardly two formations had similar salvage schemes, and the extent to which operations were successful depended in the main on how far the formation made its Ordnance Officer responsible for the work.

By the end of the war salvage had become quite a cult, notices of the quack advertisement type were to be seen—" what have you salvaged to-day "—and a Salvage club was started in England whose magazine discussed subjects such as rat destruction or how best to use up kitchen refuse. *Punch* even had its joke, the picture of a child holding by the tail a tabby in the last stage of decay and saying, " Mummie, I've saved a perfectly good dead cat."

Another result of the shortage of shipping was that as many services as possible were concentrated in France. Special workshops were set up to deal with the heavier class of repairs to artillery equipments and ammunition hitherto carried out in England, and a number of extra hospitals and convalescent camps were installed.

The last event that need be chronicled was the

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creation of a Supreme High Command among the Allies in the spring of 1918, at the time when American troops were beginning to arrive. This made it possible to reinforce any threatened point from an international reserve, and portions of the front were actually held by Corps and divisions of three nations whose arms, ammunition, equipment and uniform were not interchangeable. However sound the appointment of one Generalissimo to co-ordinate the whole of the operations, there can be no doubt that the mingling of French, British and American troops added considerably to the difficulties of all engaged on maintenance services and of none more so than their respective Ordnance Departments.

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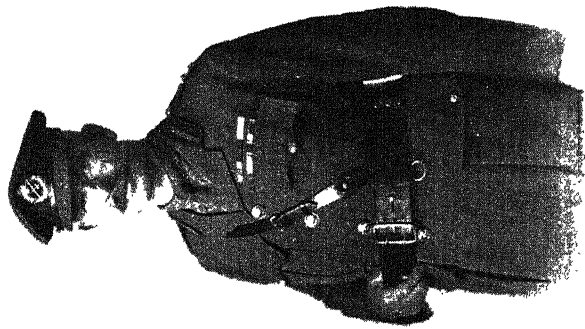
It will be seen from this review that in many ways conditions in 1918 were in sharp contrast to those of 1914; and though the arrival of a plentiful supply of munitions relieved the Corps of a great load of anxiety, other factors combined to make its burden very much heavier.

To say that our Expeditionary Force of 6 divisions became 63 divisions formed into 20 Corps divided among 5 Armies conveys a quite inadequate idea of the growth of Ordnance work, which increased not only numerically but functionally.

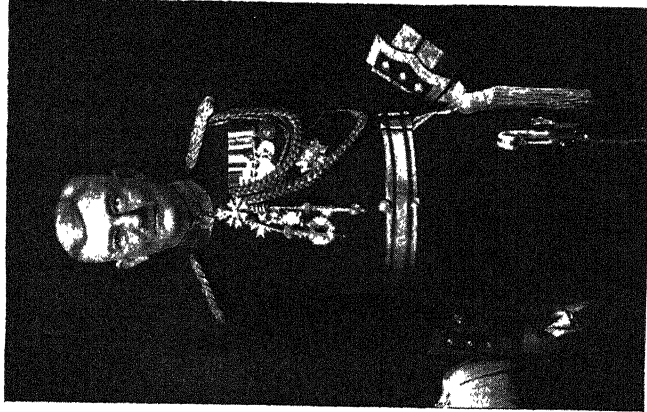
For this the chief cause was the immense use made of artillery; an unmistakable lesson of the war being that the modern gun cannot keep the field without well equipped workshops close at hand at which it and its carriage can be periodically overhauled and adjusted. Equally, the war proved that those who have to look after ammunition require technical training. The rate of fire possible from the modern gun is so great that huge reserves had to be kept; the types of ammunition were many and intricate and, unless cared for by specialists, it was bound to suffer damage, deteriorate, and become so inaccurate that to fire it from a gun might be a sheer waste of money.

But the care of guns and ammunition were only two

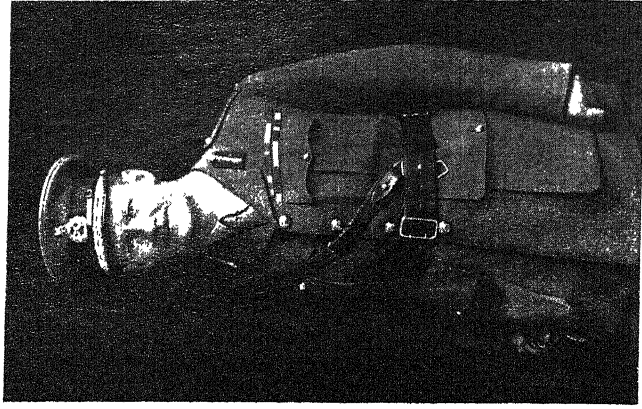
among many directions in which there was a great expansion in Ordnance work owing to the increased complexity of military equipment. So numerous did its ramifications become that the work of the Corps can best be described by dealing in separate chapters, first with the parent stem at headquarters, next with the offshoots at the front, thirdly with the roots on the lines of communication, and lastly with the branches connected with ammunition supply, which had a semi-independent organization.



MAJOR GENERAL SIR H. W. PERRY,
K.C.M.G., C.B., C.S.I.
(also D.O.S. Gallipoli and Mesopotamia.)



MAJOR GENERAL SIR H. D. E. PARSONS,
K.C.M.G., C.B.



MAJOR GENERAL SIR C. M. MATHEW,
K.C.M.G., C.B., D.S.O.
(also D.O.S. Salonika and Mesopotamia.)