



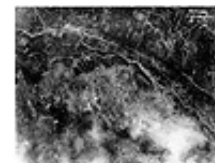
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6. Supporting the Attack: Barrages and Direct Fire

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Introduction

Artillery, in the eyes of the troops it supports, performs two main tasks in a battle: it first makes an assault possible, and it then covers that assault with fire. We have already traced how the Royal Artillery prepared the way for attacks with [bombardments](#), and how large the voice of the infantry and General Staff was in designing bombardments. As might be expected, they were even more influential when arranging the supporting fire.



Before the war, the British Army had no concept of a creeping barrage, or indeed of any sort of linear or area barrage of artillery fire covering an attack. While *Field Artillery Training* contained the germs of a creeping barrage (Section 157 mentioned fire lifting onto successive targets), to see them amid everything else in *FAT* requires a generous dose of hindsight. During the war, nobody pointed to Section 157, while they certainly did point to *FAT* on other matters. After the war, during inquiries about the origins of the creeping barrage, nobody pointed back to *FAT*. Because the development was new and important, people hunted for its antecedents. Results were sparse: generals usually credited someone else, although acolytes sometimes attempted to reflect glory on their superiors by giving them the credit. ¹ If the concept had simply come from *FAT*, somebody would have mentioned it.

The principle of providing covering fire is an old one. An early example happened on the Somme, but in 1346 rather than 1916—Edward III's archers covered his troops fording the river. ² As an abstract principle, it was clearly understood by the Royal Artillery. Once the infantry were close enough for the final charge (a few hundred yards), "artillery fire should become frequent and intense ... the object being to demoralize the defenders and reduce the volume and effect of their fire so as to afford to the infantry the opportunity to assault."



³ *FAT* added a few practical points and mentioned "searching the rear of the [enemy] position" once the infantry charged. ⁴ Crucially, however, it added that "no considerable amount of ammunition should be devoted to this object." ⁵ Creeping barrages require substantial amounts of ammunition, so this advice was clearly not advocating a 'creeper.' Henry Bethell went only so far as to recommend that the supporting batteries should increase their range when the friendly infantry were one hundred yards from the enemy position. ⁶

Furthermore, this sort of activity was not practiced, neither at the artillery firing camps, nor by the infantry, nor in combined maneuvers. Peacetime live-fire practice, especially of something as dangerous as a creeping barrage, would have been extraordinary (not least because any slip-up would have led to very difficult questions in Parliament), but if any real concept of the creeping barrage had existed it could have been represented with flags. The British army frequently used flags in training both before and during the war, and there would have been no more natural way to handle the concept that was used to represent a creeping barrage in wartime training. It should be said that no other army used a creeping barrage, and all had the same problem.

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Instead of a creeping barrage, the preferred method of artillery support was for a few batteries (as few as possible) to fire on the objective until the infantry got too close for safety, a method with which the army was comfortable. This method fitted well with the pre-war subdivision of divisions into brigade groups, pairing off infantry and artillery

brigades. ⁷ Some called it affiliation, others attachment, and it is hard to find a difference, although during the war the meanings became firmer. For instance, in the 3rd Division, "Artillery brigades usually marched ... with the infantry brigade to which they were affiliated and under the orders of the Brigadiers of those brigades." ⁸

Even in the absence of any pre-war ideas of a covering barrage, the concept developed quickly. The infantry needed help, so the artillery did what it could. While the concept of the creeping barrage would arise in the span of only a few months, perfecting it took years. Eventually the infantry became so accustomed to a superb barrage they grew over-reliant, and artillerymen had to argue that the infantry should do more of their own work. This did not stop artillerymen from providing the splendid barrages for which the infantry clamored, but they saw how they were limiting success through the very means that made it possible. As conditions changed rapidly in 1918, gunners changed their tactics, this time without infantry objections, back toward the pre-war methods that had not been wrong in themselves, but were simply wrong for trench warfare.

1914

In 1914, the BEF fought as it had practiced, with short artillery preparations and virtually no covering fire for the last stages of the infantry assault. Frequently, since the Germans were in hastily constructed defenses or none at all, it worked. At the same time, options were few. Battlefield communications were scanty, and battle situations were often too fluid for a creeping barrage to be organized. Even in 1918 it took eighteen to twenty-four hours to organize a barrage, and immediate counterattacks could not wait for a barrage. As an example, the Worcesters' famous counterattack at Gheluvelt on 31 October 1914—two hundred men plunging back into the battle and surprising the Germans, who retreated—could not have succeeded if there was a day's delay to arrange supporting fire. Although the British would have been better prepared, so would the Germans. Nor could the ludicrously small staffs of 1914 have organized a full barrage—CRAs lacked clerks, let alone staff officers. There were few options available beyond having a few batteries of 18-pounders fire as close ahead of the infantry as they could manage. ⁹

One sensible suggestion was made, combining advice from *FAT* and the tactical situation. In mid-September, John Headlam, CRA of the 5th Division, suggested that the infantry attack a key hill in the open so the gunners could watch their progress and keep the shells just a few yards ahead. ¹⁰ This was a common-sense suggestion from *FAT* rather than a stroke of genius on Headlam's part, but it made no difference. The infantry commanders brusquely discarded the idea, preferring to attack through woods that blocked Headlam's artillery from seeing their targets. The artillery fired a brief preliminary bombardment and then had to stop because it could not see where the friendly troops were. The attack failed. Headlam kept suggesting his plan, but beyond this instance there is no evidence of any kind of barrage ideas in 1914. ¹¹ There were extremely few set-piece attacks, and the late December attack on Messines Ridge apparently had no supporting fire at all.

1915

1915 saw the biggest development in infantry-support fire because it witnessed a conceptual change. Later years would see tremendous improvements in how a barrage was organized, but these were evolutionary. In 1915, a completely new idea sprung up; never again did a new idea spring up.

Things did not start dramatically. The first attack of the year was at Neuve Chapelle, and there was no barrage directly in front of the infantry. A bombardment pummeled the German trenches for a few minutes and then the guns switched to entirely different targets, neither lifting onto a second line of trenches nor lingering on the first while the

infantry charged. There were good reasons for this. In this extremely flat region observation was difficult, and it would have been difficult to register on the German second defensive line. The German second line itself was exiguous; there were only a few strongpoints, and since they were not manned British intelligence had not detected them. Finally, while the process of registration of the front line was concealed by being spread over several weeks, registering points in the second line would have been very suspicious behavior and would have endangered the surprise that was important to the plan.

There was, however, a barrage of sorts used at Neuve Chapelle. It was a *barrage* in the literal sense of the word, a barrier, and it was fired about 1,000 yards away from the British trenches to delay the arrival of German reserves. Ammunition was scarce, and this barrage was not a high priority, but it may have mildly delayed the German reserves. The lack of the other sort of barrage, one on the German trenches just ahead of the infantry, did not lose the battle. The main problems in this encounter were command confusion about moving the reserves forward in the right-center sector (about which the artillery could do nothing) and a failure of the bombardment to hit the targets on the left. A creeping barrage would have helped, but would not have changed the results.

After Neuve Chapelle, the BEF debated where to attack next, and John Headlam again suggested attacking uphill in the open, to give gunners their best chance to 'walk' shells ahead of the infantry. ¹² This attack was never made, and Headlam gave up on this plan, but it was an intelligent method of dealing with the fluctuations of infantry combat: if one part of the attack was held up, the gunners covering that sector could see what was happening and adjust their fire, while successful infantry would not be held up by their neighbors. (It may have harked back to the Boer War, where guns could support the infantry better in the open than in close terrain. However, in that war new technology—field telephones—made it possible to control indirect artillery fire. ¹³) In World War I, no new technology arrived to allow equally detailed control of artillery fire. Plenty of ideas were tried to improve communications, but nothing was going to solve the problem until man-portable radios were developed. Wig-wag signaling had been largely discredited in the Boer War, runners were slow and vulnerable, wireless sets were bulky and fragile, and air observers had great difficulty telling muddy hostile infantry from muddy friendly infantry. ([Photo Essay 1](#))

There was a second problem. If a commander had information that some infantry were held up, did he disrupt the whole attack plan to help them? It was easier to improvise in a small attack, but as attacks grew larger the complexities multiplied, and commanders decided that it was not worth disorganizing an entire corps attack because a single brigade or battalion was stopped. Headlam's solution was tailored to a small scale—it could only work in a few types of terrain (uphill) and for relatively small units. If the goal was to rupture the German line, his scheme was impractical. Quite likely, senior commanders recognized Headlam's method as a blind alley and avoided it, trusting that something better would turn up.

For several months there were no promising developments. The First Army wanted the artillery to "support the infantry during its attack" and shrapnel barrages to be "expanded as the infantry advances." However, this advice was tentative and referred to protective barrages rather than supporting ones. ¹⁴ (Protective barrages tried to block and/or disrupt German counterattacks and were fired beyond the British objectives.) Attacks at Aubers Ridge, Festubert, and along the Rue Vert featured bombardments (albeit totally inadequate ones) but no barrages. ¹⁵ None were more than marginally successful, and all were less successful than Neuve Chapelle. There was a new development in these battles, but an unwelcome one. Whereas at Neuve Chapelle the bombardment was fired at the same rate throughout, from Aubers Ridge onwards the artillery fired more intensely during the last few minutes before the infantry assault. Since the Germans were not, in fact, annihilated—

nor had anyone expected they would be—all the rapid drumfire served to do was give them a final warning that Zero Hour was a few minutes away and they should be ready to leave their dugouts. It became more and more necessary to cover the infantry during their advance, not just to open the way with a bombardment.

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In mid-summer, a new idea arrived in a small attack for some inconsequential railway tracks near Hooze. The 6th Division, of VI Corps, made a dawn attack on 16 June in an action too small even to warrant mention in the *Official History*. The artillery fired three lifts: from the front trench, to the support trench, and to some communications trenches. ¹⁶ As the name suggests, the artillery fire 'lifted' from one trench line straight to the next, and the plan was that this would happen just moments ahead of the arrival of the advancing British infantry. In some ways the barrage was simply a light repetition of the bombardment timed to take place just before the infantry assault, and thus compensate for its lightness by good timing. In other ways it was fundamentally different, being an effort to suppress rather than destroy. Despite the new technique the attack failed, probably due to the extremely light bombardment; the good idea still needed improved implementation. ¹⁷ At this point the lifting barrage was a unique idea, perhaps developed by W. L. H. Paget, Artillery Adviser of VI Corps, or G. Humphreys, CRA of the 6th Division. Neither left any papers nor had a distinguished career in the war. Whoever deserves the credit as the inventor, higher authorities adopted the idea was. The development should also be seen as a remarkably quick adjustment to trench warfare: the answer arrived just three months after Neuve Chapelle revealed the problem.

In the late summer, the BEF was preparing for its largest attack so far, the battle of Loos. Loos featured the most elaborate artillery plan to date, including the longest bombardment and further development of the 'lifting' barrage. The barrage had been identified as an aid to the infantry, and was not unique to the battle of Loos, although previous authors have noticed its use in the operations at Loos and missed the 6th Division's June attack altogether. Lifting barrages were used on the same day all along the British front, in different corps and armies. I and IV Corps' main attack at Loos used a lifting barrage, as did the diversionary or subsidiary attacks by III, V, and Indian Corps. ¹⁸ The details varied from place to place, and there is no letter or conference that can be identified as the inception of the barrage. The Meerut and 8th Divisions included 'creeps' (where the shelling swept over the ground between trench lines) as well as lifts (moving straight from trench to trench, skipping the intervening ground), so even here it is impossible to trace a single point of origin. Clearly someone at a high level—presumably GHQ, since both the First and Second Armies used the same method—had spotted the new idea and supported it. Whoever the patron was, there was no publicity, which emphasizes that it was a practical development rather than one requiring profound adjustment of the BEF's fighting style. The Second Army wrote to all its corps ordering a lifting barrage, while the First Army apparently achieved the same results verbally. ¹⁹

The father of the idea is still a mystery. VI Corps had no famous thinkers. The MGRA at GHQ, John du Cane, was an intelligent gunner but no great tactical innovator; he was also busier dealing with shell and gun supplies than with tactics. ²⁰ After the war, various gunners remembered what they had done at Loos, but nobody mentioned the other attacks that day or the June attack near Hooze, which rather devalues their testimony. ²¹ There is a slight possibility that the idea came from the French. ²² Unfortunately, there is no record of any visit where barrages were mentioned, nor mention in any British source of adopting a French idea. French artillery thinking of the period was broadly parallel to British ideas, and in June a British translation of a French pamphlet spoke of artillery "increasing its range *progressively* in order to create ... a ... wall of fire under cover of which the infantry can advance." ²³ In the absence of a study of all French units, it is possible that the French thought of the lifting barrage first, but it appears unlikely that any French development

directly led to the British creeping barrage.

A British pamphlet of late July built on June's results, using the term 'barrage' to describe an artillery tactic during the infantry advance rather than as a barrier. ²⁴ But at the time the BEF had to worry almost as much about the shell shortage as about the Germans. With that looming in everyone's mind, the General Staff warned against wasting shells on open ground. ²⁵ This was a strong reason to prefer a lifting barrage to a creeping one that covered every bit of ground: it used vastly fewer shells. As long as the Germans defended mainly from their trenches, the lifting barrage could be just as effective with less investment. There is no evidence of the idea being acquired from the Germans, who first used something similar in March 1916, but on the Eastern Front (some covering fire was also used at Verdun in late May 1916). ²⁶ However, both of these came several months after the BEF had used a prototype of a creeping barrage, and it does not seem that either side felt it had a secret weapon. In all likelihood it was a sensible idea that developed independently to help solve universal tactical difficulties facing all armies on all fronts.

There were drawbacks with lifting barrages, and indeed with any barrage controlled by timetable. It was not possible to bring more fire to bear on a strongpoint that held out, so resistance would ripple through an attack as the infantry lost their protection and support. First one unit would be held up, then it could not pressure the Germans, so more Germans fired into the flanks of other British units. Those units slowed down and the barrage got ahead of them (they "lost the barrage" in the terminology of the day), and ultimately a whole attack could be stopped, or at least a German salient would survive that flanked the newly gained ground and made counterattacks easier.

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Ideally, reports of local troubles would be passed back, and the artillery would deal with the problem. But in World War I tactical communications usually failed. Telephone cable could not be buried deep enough to survive heavy shelling, and that shelling not only slowed or stopped runners but kept signalers from standing up and using flags or lamps. By 1917, special radio sets and earth-conducting telephones could convey some information but were bulky, temperamental, and vulnerable to interception.

Timetabling was unavoidable, although the ultimate solution was flexible infantry tactics so that the infantry could fight their way forward if the barrage did not do all the work for them. Some provision was made for the inevitable trouble spots. ²⁷ The infantry had to request a re-bombardment from corps, which then switched guns from other tasks. The difficulties can be imagined: word had to get from battalion to brigade, through division, to corps, which then had to organize the requisite artillery batteries and pass orders. The artillery then had to hit the target. The process was complicated and prone to breakdown (or at least serious delays) at any stage, and the only short-cut that could be made was to specify that all such re-bombardments would last for 30 minutes, with the last five being intense. This last point was a double-edged sword, for while it served to warn the British infantry when the bombardment was due to end, it warned the Germans as well.

The battle of Loos was intended to create a breakthrough, and the BEF did not neglect planning for the anticipated exploitation. Field artillery would revert from corps to divisional command when the German lines were broken, which was optimistically expected to happen eighty minutes after Zero Hour. ²⁸ From that point the artillery would operate much as it had in 1914. Heavy artillery would remain under corps control, advancing when needed and once routes had been prepared. The planners had spent time on exploitation planning but had not calculated what to do if there was no breakthrough; there was certainly no idea of organizing barrages to support repeated attacks grinding slowly forward. In the event, the Germans lost their first trenches, but there was never an opportunity to put the exploitation plans to the test. After the battle, the lesson was plain that centralized

control was necessary for the set-piece battle—the carefully choreographed breakthrough—but affiliation must return when the fighting "becomes indiscriminate" during the pursuit. ²⁹ Given contemporary communications problems, this was not unreasonable.

1916

Based on the experience of one single day—25 September (at Loos and elsewhere)—the BEF continued developing the barrage to support and protect the infantry for the 1916 campaign. For an organization supposedly so hide-bound and slow to react as the BEF, this is impressive. Intelligent deductions and modifications were made instantly. The First Army grasped the essence of the barrage: "The great object to be obtained [during the assault] is to prevent the enemy from manning his trenches.... A sudden 'lift' of all artillery fire is objectionable, as it informs the enemy when the assault is to take place ... and batteries should 'lift' a short distance at a time." ³⁰ At the same time, the First Army also warned against a real creeping barrage because of the heavy ammunition expenditure, which was more of a concern in 1915 than 1916. Apparently some of these details were forgotten in the shake-up of BEF command six weeks later, because Haig as commander in chief had different priorities than Haig as commander of the First Army.

Just as the subsidiary attacks beyond Loos had featured lifting barrages, the subsidiary attack on 1 July 1916 used the same sort of barrages as the main attack. The BEF had firmly adopted the barrage, and it would come to be used by all armies and corps. There is no evidence of any discussions about an army-wide barrage during the planning of the Battle of the Somme, certainly not to the extent of the argument about the preliminary bombardment. ³¹ (A substantial article on this point is available as [Appendix 41](#).) However, while there was to be a barrage everywhere, the details were left to local commanders. Rawlinson simply told his corps commanders "the guns must 'arrose' [apparently meaning to shell] each objective just before the infantry assault it." ³² The one uniform point was that the barrage's timing was based on the infantry's pace: the lifts were timed to take place just before the infantry arrived at the given German trench, if everything went according to schedule. Most corps used a lifting barrage on 1 July because they expected the Germans to be fighting from the trenches. (If the Germans were in their trenches, there was no point in shelling open ground between the trenches.) British objectives were also defined in terms of German trench lines, and using these lines to define the artillery's task simplified planning. Reflecting the greatly increased complexity of such a large battle and the inexperience of many divisions, the first barrage maps were issued. Previously there had been bombardment maps, but this was the first graphical representation of a barrage. ³³

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Several corps barrages had a creeping element that was created to deal with unexpected resistance or undetected positions. ³⁴ Instead of lifting straight from one German trench to another, these "raked" or "drifted" across the intervening ground. While the Fourth Army clearly told each corps to provide some sort of barrage, the corps varied in their approach, even within themselves. Different divisions issued different artillery orders, and these orders differed in ways beyond the extent of men searching for clear words to express a relatively new idea. For instance, in XV Corps, the 7th Division ordered the artillery to lift at a rate of fifty yards per minute, while the 21st Division contented themselves by merely having the barrage "gradually drift forwards." ³⁵ This laissez-faire attitude is in sharp contrast to the general trend in the BEF. In many respects, by this point divisions were becoming cogs in the machine, corps were increasingly gaining authority over their divisions, and armies were shuffling subordinate formations around. This centralizing trend was especially true for the artillery, so it is remarkable that so much latitude was left to individual divisions regarding the barrage. ³⁶

Many elements of the barrage on 1 July were the same as at Loos. Re-bombardments followed exactly the same pattern: half an hour of shelling with the last five minutes more intense. Again a breakthrough was expected, and this time the cavalry were ready to exploit it. They kept their own horse artillery batteries, and a few 4.5-inch howitzer batteries were also allocated to them. These guns fired during the bombardment, but they were specifically ordered not to fire on 1 July so they would stay fresh and be ready to advance. ³⁷ During the bombardment before Z Day, there were even tricks played to mislead the Germans about the infantry assault. Every day, an intense 80-minute field artillery bombardment was fired, and the lifting/creeping barrages were practiced. On Z Day the field artillery bombardment was to be 65 minutes, in hopes that the German infantry would stay in their dugouts an extra 15 minutes, which would provide ample time for the attacking troops. As we know, this stratagem failed, and it was very nearly the last time an intense bombardment—signaling to both sides an impending attack—was used. ³⁸

The development of the creeping barrage proper was one of the main tactical features of the Battle of the Somme. It was not a smooth process, but blind alleys were few and only concerned small details. By the end of the fighting, the BEF had developed the creeping barrage to a high level.

In the first few days after 1 July there were few creeping barrages. This was probably not intentional, and there are several explanations. First, as Prior and Wilson have shown, there were very few large attacks in the two weeks following 1 July. ³⁹ Small attacks, organized by a single division, were less likely to employ creeping or lifting barrages. These were quite complicated, and a divisional artillery commander would be overwhelmed trying to plan the bombardment, co-ordinate with the infantry, and create protective barrages, let alone implement a creeping barrage. Corps became the echelon for organizing creeping barrages, largely because divisions already had too much to do. Second, the attacks in this period were generally hastily organized. It took eighteen to twenty-four hours to organize a creeping barrage in 1918, when everybody had plenty of experience; organizing one in mid-1916 could easily have taken two days or more. Third, the number of guns a division commanded would not have been enough for a useful creeping barrage. At this point a division seldom commanded more than its own field artillery, 50-70 guns. ⁴⁰ Subtracting those guns broken from over-use, creeping barrages would not have enough weight to be effective. This was another reason for corps to organize creeping barrages, because they could order other divisions' artillery to cover an attack. As the Somme fighting went on, divisional artillery gradually was divorced from the infantry, spending longer periods on the Somme than the infantry. The standard allocation of divisional artillery was more than a division needed in defense, yet was an amount still too weak to cover an attack. During the winter of 1916-17 some field artillery brigades were withdrawn from divisions and designated as Army Field Artillery, which provided a reserve of field artillery for offensives.

Despite these difficulties, there were several attacks made using a creeping barrage. ⁴¹ The large attack of 14 July had only a sketchy barrage. Oddly, XIII Corps (which had a good barrage on 1 July) made no plans for one, while XV Corps had improved their barrages. ⁴²

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The experience of just two weeks was enough for GHQ. On 16 July a memo spread the new gospel:

One of the outstanding artillery lessons of the recent fighting has been the great assistance afforded by a well-directed field-artillery barrage maintained close in front of the advancing infantry. It is beyond dispute that on several occasions where the field artillery has made a considerable 'lift,' that is to say has outstripped the infantry advance, the enemy has been able to man his parapets with rifles and machine guns. It is therefore of first importance that in all cases ...

the field artillery barrage ... should not uncover the first objective until the infantry are close up to it (even within 50 or 60 yards). [43](#)

This was repeated in *Tactical Lessons of the Recent Operations* and was ceaselessly reiterated until the end of the war, although the repetition does suggest that the point was not always taken. [44](#) Barrages were a vital part of the infantry attack, and thus were placed at the center of operations. Once tanks had appeared on the scene they drew considerable enthusiasm, but GHQ reminded the armies that tanks are "entirely accessory to the ordinary methods of attack, i.e., to the advance of infantry in close cooperation with artillery." [45](#) Tanks themselves required the aid of a barrage, reminding the BEF which of the two was the more important element. [46](#) Haig himself was interested in the new tactic, repeatedly jotting in his diary the minute details of successful creeping barrages. [47](#)

While GHQ was proselytizing, the troops on the Somme were busy improving the creeping barrage. [48](#) By late September the terminology had finally been settled and a general rule existed about the number of guns required. One 18-pounder was needed per twenty-five yards of attack frontage; 4.5-inch howitzers were automatically in proportion, because a division had one-third as many. This was broadly in line with contemporary French practice (one 75mm gun per twenty-five meters), but when German defenses were stronger, more guns had to be used. In August 1916, Haig noted using a gun per twenty yards, and the standard for 1917 would become one per fifteen yards. On the other hand, weaker German resistance allowed the BEF to use fewer guns. For attacks on key strongpoints, the Fourth Army judged that one gun per ten yards was necessary, but against an ordinary stretch of trenches one per seventeen yards was adequate. [49](#)



Various methods were tried to obtain the best results, although it would be too much to call these experiments because there were too many variables and there was no spirit of experimentation with men's lives on the line. Some 18-pounders might search ahead of the main barrage, or fire a mixture of a lifting barrage and a creeping one, with some guns lifting and the rest creeping. [50](#) The barrage might begin in front of the first German trench if the Germans were suspected of moving forward to avoid the barrage. [51](#) Once there was an attempt at surprise, with the creeping barrage starting three minutes after the infantry attacked. This was extremely dangerous and clearly unpopular, because it was not repeated until August 1918, by which time the circumstances were very different. [52](#) During pauses in the infantry's advance, the barrage might sweep back and forth to disconcert the German infantry and disrupt counter-attacks.

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The pace of the barrage was always a cause of concern: if it moved forward too fast, the infantry would be left exposed to the German trench garrisons, and if it was too slow then German reserves moved up and counter-attacks were organized. Haig frequently urged a faster pace because he was diagnosing a decline in German morale, but occasionally even 'thrusters' like Hubert Gough wanted the advance of the barrage slowed down. [53](#) From the artillery's point of view, the question boiled down to increments and frequency: how long each step of the barrage was to be and how frequent those steps were. The artillery was not particularly involved in setting the pace of the barrage, which was set by the unit commander, who listened more to his infantry than the artillery. For some time there were arguments about 50 versus 100-yard lifts, and the artillery strongly preferred 100 as it halved the number of adjustments for gunlayers and fuse-setters (and should therefore have halved the number of mistakes they made). Eventually this became standard, if still subject to local alterations for specific purposes.

While the 18-pounders were firing the creeping barrage, the field and heavy howitzers

would also support the attack. The 4.5-inch howitzers would typically fire a lifting barrage a trench ahead of the creeper and also rake along communications trenches. Heavier howitzers would fire still further ahead, targeting strongpoints, headquarters, and other key targets. There was seldom any difficulty in organizing this sort of support, and the infantry rarely complained about it. They did complain loudly, however, if the 18-pounders were shooting short, and the absence of complaints about larger guns suggests they stayed far enough ahead of the infantry.

One of the great problems of the creeping barrage was that it had to go by timetable. As explained above, this meant that a local delay could ripple through an entire attack. It was virtually impossible to control artillery support through observers, so there had to be other ways to fix problems with the timetable. At first there were efforts made to send artillery liaison officers along with attacking infantry units (sometimes brigades, sometimes battalions) and give the liaison officer authority to make changes in the barrage. ⁵⁴ While well-intentioned, this negated the larger plans and could make the ripple worse rather than better. In order to give the infantry the control they craved over their own support, another path was taken. Division commanders could switch some 18-pounders to help a checked battalion, but since these guns were already firing somewhere else it meant robbing Peter to pay Paul. The Reserve Army spotted the problem and devised what would later be called "superimposition," where some guns would fire to thicken the barrage beyond the normal amount but would also be available to transfer their fire where it was needed. Because they were surplus to the normal density of the barrage, when they were switched elsewhere they did not reduce the fire density to below the prescribed norms. This idea was presumably either Gough's own, or that of Walter Strong (who was temporarily MGRA at the Reserve Army), although neither man is usually hailed as an innovator. ⁵⁵ In 1916, with the BEF still short of artillery, there was little that could be done about this and the measure survived, and indeed was broadened so that an infantry brigade commander could call upon a battery of 18-pounders and a division commander had a battery of 6-inch howitzers. ⁵⁶

As the Battle of the Somme went on, efforts to use artillery 'on call' increased. Ground-based communications ranged from difficult to impossible, so the RFC lent a hand. "Contact Patrols" tried to find both what the infantry had captured and where they were checked. Distinguishing friendly troops from enemies when both were muddy and lurking in shell-holes was a difficult business, and not surprisingly many times infantry were cruelly shelled by their own guns, or indeed from both sides. For the pilots to recognize them, the infantry had to lay out cloth panels, which were then visible to foe and friend alike. Still, during the Somme battles aerial co-operation improved considerably. Previously aircraft had mainly worked in quiet sectors, adjusting fire in bombardments of fixed targets. On the Somme the RFC developed the system of "[zone calls](#)," which allowed much faster reaction—fast enough to deal with moving targets or tactical situations such as a counter-attack. ⁵⁷

Reconnaissance work also improved, bombing got better, and artillery spotting became more proficient.

Over the winter of 1916-17, the BEF absorbed the lessons of the Somme campaign. Most infantry divisions had fought under a creeping barrage, and about half the corps had organized one. These units therefore had some experience with the creeping barrage, but to standardize procedures and also to help the inexperienced units still coming out from Britain the new batch of SS pamphlets had much to say about barrages, from their purpose through planning to execution. According to *Artillery in Offensive Operations* (available as [Appendix 20](#)), "the support of the infantry during the attack is at least as important" as the bombardment. ⁵⁸ The main purpose of field artillery was now barrages, a change that ratified the withdrawal of 18-pounders from bombardments. They were still used in harassing fire, especially at night, but even the previous practice of sneaking individual guns up to blast a particular strongpoint with direct fire was largely

dropped in 1917. Artillery was, as always, an aid to the infantry: "The barrage has two main properties: (a) it is a man-killing agent; (b) it acts as a screen to cover the movements of the infantry from view." Finally there was a cautionary note:

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The barrage system has been lately developed. It must be remembered that, while the following notes deal with the procedure that has recently been the most successful, it is only to be expected that the enemy will devise new methods to defeat our barrage fire. New methods on his part will call for immediate modifications in our artillery tactics.

Not just tactics were reviewed; technical details were also spelled out, with advice given on all varieties of barrages and ammunition. ⁵⁹ Meanwhile, the gunners reflected on how best they could support attacks. Charles Budworth, MGRA of the Fourth Army, drew on his months of experience at the center of the Somme campaign for some lessons:

During the Battle of the Somme, generally speaking the "Infantry has been required to conform its movements to those of the Artillery barrage." This is right practically, nevertheless, theoretically the "Artillery barrage should conform to the movements of the Infantry." ⁶⁰

Budworth clearly adhered to the pre-war conventions on which arm was decisive and which was supporting.

1917

Already during the Somme fighting the Germans had altered their defensive tactics, and more changes were to come in 1917. As the Germans relied more upon defense-in-depth and less on a strong front line, the importance of bombardment declined and that of the barrage rose because there were fewer high-value targets (especially near the front) but many more low-value ones. Two pieces of new technology improved barrages. There was also a small return to direct fire support, but only in exceptional circumstances.

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In February and March, the Germans caught the Allies napping by withdrawing to the Hindenburg Line, leaving only rear guards to delay the Allied advance. With their customary tactical skill the Germans extracted the maximum of delay with the minimum of troops, holding woods and villages until the situation got too hot, which was typically when the Allies brought forward a few guns. ⁶¹ It was seldom necessary to develop a full bombardment and barrage, and the Fourth Army reported to the rest of the BEF how appropriate Field Service Regulations and *Field Artillery Training* were for mobile warfare. ⁶² Besides the usefulness of having a few 18-pounders forward to deal with isolated strongpoints, the second lesson concerned the effect of even a few heavy pieces. These were disproportionately effective because of the morale effect of a large shell upon an isolated rear-guard, which generally chose discretion over valor.



Back in trench warfare, the Germans developed a new tactic. They fired machine-guns at long range, safely beyond the British barrage. There were three obvious answers, all quickly deduced, passed up and down the chain of command, and implemented. First, the 'back' or protective barrage (fired to protect the infantry at their objective) could sweep further back than hitherto. ⁶³ This would chase the German machine-gunners out of range. Second, the whole creeping barrage could be conducted in more depth than before. Instead of three lines of shells (two from 18-pounders and one from 4.5-inch howitzers), a whole range of guns could be added. The obvious

advantages of this idea led it to be rapidly adopted by all echelons of command, including Haig himself. ⁶⁴ Thus 60-pounders were mixed in, more heavy howitzers and, for the first time, machine-guns firing over the heads of advancing infantry. By October 1917 there might be as many as seven belts of fire in a creeping barrage, covering one thousand yards of the battlefield at any moment. ⁶⁵ Each of these belts could independently move back and forth so that the German infantry would never know when it was safe to come up and man their positions. ⁶⁶



The third technique for defeating deep machine-gun placements was to obscure their view. Ordinary shrapnel shells produced a bit of smoke, but in 1917 smoke shells were introduced. ⁶⁷ Techniques for using smoke shells were disseminated long before there were enough such shells for widespread use (April 1917), but they were not accepted with particular grace. Despite official prohibition, the 9th (Scottish) Division used smoke in a creeping barrage. ⁶⁸ After the division's spectacular success on 9 April (the best single penetration of German trenches between 1914 and Cambrai), there were questions from above about what had worked so well. When the truth came to light about the 9th Division ignoring guidelines, the guidelines were changed. ⁶⁹ Within a week smoke shells were reserved for special operations where they could make the most difference. ⁷⁰



An organizational change also led to improvements in the creeping barrage. In 1916 the CRA of an attacking division commanded all the field artillery supporting that division. While this meant unity of command, it was exercised directly from the CRA to the brigades, so that a single CRA tried to control perhaps ten to twelve brigades of artillery. In 1917, artillery brigades were slightly larger, so the same number of guns represented fewer units. Even more importantly, the brigades were grouped. Brigades operated in pairs or even threes, reducing the amount of work for the single divisional staff, and also freeing a brigade commander for liaison with the infantry. Thus one brigade commander would handle the artillery while the other worked with the infantry. ⁷¹ This is further evidence of the care the artillery took to help the infantry. Another option that presented itself thanks to the improved staff work and infantry fighting skill was varying the barrages. A creeping barrage might go a certain distance (perhaps two thousand yards), then the artillery would shift to firing concentrations on specific targets (perhaps key strongpoints or a ridgeline), with the infantry fighting around the artillery fire. ⁷² This recognized the improved tactical skills (and increasing firepower) of the infantry, which could now fight on its own rather than feeling it could only follow a line of shells.

As mentioned above, in 1917 the relative importance of bombardments and barrages changed. In 1916, despite the famous bombardment at the Somme, there were not really enough guns to effectively deal with large sectors of the German line. In 1917 there were: new batteries were still deploying from Britain, and new equipment was arriving to improve the effectiveness of troops already in the field. ⁷³ More and better guns fired more and better shells; the Germans saw what was coming and abandoned linear defenses. They put more emphasis on counter-attacks, delivered as soon as the British infantry halted or even while they still advanced. ⁷⁴ Strongpoints became bases for maneuver and rallying points rather than places to be held to the last man. Thus there were fewer good targets for the British bombardment, yet more targets overall. But old habits die hard. The British infantry wanted the German trench network smashed before an attack, and it took several months of 1917 before these requests changed. Now the German trenches were seen as positions that could be captured and then used to defend against German counterattacks, and the Royal Artillery was told to switch more effort from bombardments to creeping barrages. Because they had abandoned the trenches, the German infantry were moving and fighting

above ground (or at most in shellholes), and thus made excellent targets for the barrage. ⁷⁵ This became more pronounced as the year went on. At Arras, the creeping barrage was only somewhat better than in 1916, because the Germans in that sector were slow to adopt the new defensive tactics and so there was less urgency in improving the barrage. At Messines, the limited objective meant the bombardment was more important, but the British still developed the barrage. ([Photo Essay 2](#) has some photos of practice barrages at Messines. This [animation](#) shows the barrage in front of one of the divisions attacking at Messines. [Map 1](#) is the static version of the animated map. [Map 2](#) and [Map 3](#) show the development of the barrage in addition to the field artillery's creeping barrage.) Once their defenses were smashed and the ridge captured by the British, the Germans saw how events were developing and did not waste troops counter-attacking in circumstances where British artillery would have slaughtered their infantry. Similarly, in the fighting for Hill 70, when the Germans launched counter-attacks the Canadians mauled them with massive artillery support. This was an intelligent application of fire and movement, but in a way not foreseen in *FSR*.



[Map 1](#)



[Map 2](#)



[Map 3](#)

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During the Passchendaele campaign, the creeping barrage reached a pinnacle of development. ⁷⁶ Several times during the campaign the BEF thoroughly bombarded the German defenses. In between these attacks they fought battles, with the artillery mainly firing counter-battery missions and barrages. Indeed, at times creeping barrages were so heavy that some officers speculated that a heavy barrage could replace the bombardment. ⁷⁷ The strategic plan was to break through the German lines, which meant that the infantry quickly had to advance deep into the German positions and the barrage had to be stretched to unprecedented distances. This failed because the objectives were beyond field artillery range, and heavy artillery was technically unsuitable for a creeping barrage. Because of the larger lethal radii of heavy artillery shells (e.g., 200 yards for a 6-inch shell), the infantry had to stay well behind the barrage and the Germans had time, after the barrage had passed and before the British infantry could arrive, to get out of their shelters and open fire. ⁷⁸ Using heavy artillery for the barrage also took it away from counter-battery work, so the German artillery was free to do more damage. Optimistically, the Fifth Army had prepared plans for artillery support during the breakthrough phase; divisions were to advance their field artillery, and also would be allotted some heavy artillery beginning at H+490 minutes. ⁷⁹ But the Fifth Army never got close to a breakthrough, and Haig handed responsibility for the offensive to the Second Army.

Once the Second Army took over the main effort, they realized that barrages had to be organized as never before ([Appendix 23](#)). The Fifth Army had been less advanced, even wondering whether division commanders could control their own creeping barrage, reversing corps control and probably ignoring their neighbors. ⁸⁰ Some things, like using diagrams to help planning, were simple ways to improve performance. But the Second Army backed that up with a determination to use enough artillery to do the job. The creeping barrage became a weapon in its own right, not just support for the infantry. Sweeping back and forth, varying the timing from day to day, the barrage probably killed as many Germans before an attack as it suppressed during one. Practice barrages—normal since June 1916—were organized to lure the Germans to assemble counter-attacks in

certain areas, and those areas were then shelled during the attack. ⁸¹ The heavy barrages were also good for the morale of British infantry. Neil Fraser-Tytler, an artillery brigade commander, vividly described the infantry "fairly out for blood, and after seeing the practice barrages ... there was some confidence flying about." ⁸² Areas were regularly left out of the practice barrages to lure the Germans in, then shelled during the actual attack. The Second Army also developed the "prisoner barrage," which was exceptionally dense and fired on three sides of a rectangle. It was then pulled towards the British lines, leaving German infantrymen the choice of surrendering or taking appalling risks from shellfire. ⁸³

With the German fixed defenses shattered by the weeks of bombardment, the barrages sweeping back and forth across the landscape broke down the last element of German resistance, their defensive organization. The many small defensive positions were swept by the various belts of the creeping barrage, and the counterattacks had to penetrate the same walls of fire before they even got to the British infantry. By the end of the second phase of the battle the Germans had to abandon defense-in-depth, returning to sheer weight of numbers in a forward defensive line. ⁸⁴ But this made even more men vulnerable to British shellfire, and in the end it was only bad weather that stopped the BEF. This is not to underplay the significance of the bad weather: appalling for the infantry, it was only marginally better for the artillerymen. Guns sank into the morass, living conditions were dire, and the Germans did everything they could to make life more dangerous. A German shell fired at random into the Ypres Salient was likely to hit something, and the use of mustard gas made harassing fire that much more terrible. The artillerymen stuck it out—their principle was to continue firing their guns as long as their infantry were in the open or under attack, regardless of the weight of German fire. Haig watched the success of British tactics with subdued delight, blandly noting that "our tactical methods have defeated those of the enemy," but unfortunately turned a blind eye to the toll exacted from the BEF. ⁸⁵ His eyes were fixed on the number of German divisions rotated through Flanders, but he seems never to have noticed that the same thing was happening to the infantry of the BEF.



Over the course of 1917 the details of creeping barrages became second nature to the field artillery. The RFA had been relieved of most other duties (besides the creeping barrage, they only performed some wire-cutting and harassing fire), and constant practice improved skills and performance. Meanwhile, the infantry's calls for support grew and grew. Another indication that the infantry battle was again paramount was the declining importance of counter-battery fire, at least during attacks. After the prolonged preparations for a battle, German artillery had usually been mastered. Even when it was not, the creeping barrage was considered more important than counter-battery fire, and heavy artillery was switched into thickening the barrage, especially making it deeper. The circumstances of each British attack differed, and the artillerymen did their best to adjust the barrages to changing circumstances, such as the duration of the preliminary bombardment, depth of objectives, density of guns and troops, ground conditions, and a host of other considerations. It was truly a matter of orchestration by men who have earned their subsequent appellation of 'master gunners.'

The mammoth protection and support the creeping barrage gave to an infantry attack led to over-reliance. Ludendorff tartly wrote of 1917:

We must differ essentially ... from the attacks hitherto undertaken by the British. They believed in the efficacy of their skillfully worked out but rigid artillery barrage. This was to carry forward the infantry attack which advanced without any impetus of its own. The subordinate and, still more, the higher commanders, ceased to have any further influence. ⁸⁶

While the infantry were improving their fighting skills from the nadir of 1916, they were still hesitant to stand on their own two feet. The BEF never quite believed that artillery conquered and infantry occupied, but a corps could write, "If the artillery plan is complete and the gunners are given full time to carry through ... the battle is three quarters won before our infantry appear on the scene at all." ⁸⁷ Enormous bombardment was no longer necessary to break into an ordinary trench position. Instead, the infantry could fight their way forward, using new weapons, and even more importantly, better small unit tactics. ⁸⁸ British infantry were of course learning about trench-warfare attacks rather than open-warfare infantry tactics. (The Germans similarly treated the two as separate, with different rules, and the Americans would shortly revile trench-warfare thinking but laud open warfare. ⁸⁹) Thus they were far better at fighting through trench lines with the barrage protecting them from counter-attacks than at out-fighting the counter-attackers. With the constant toll of casualties and stream of replacements, it was naturally difficult for the infantry to progress beyond a certain level of competence.

Given the proven efficacy of creeping barrages, it is no surprise that infantry and formation commanders insisted on plenty of artillery support. Even some officers with good reputations for progressive tactics among historians had lapses, such as Ivor Maxse, who wrote: "I hold the view that ground is gained by artillery, that ground is defended by artillery, that battles are won by artillery and that battles are lost by artillery." ⁹⁰ It was left to senior artillery commanders to remind the infantry that there was something beyond trench warfare. Frustration mounted with infantrymen who "thought a creeper and a heavy howitzer barrage 200 yards beyond would take them to Berlin." Birch's reaction was scathing and sarcastic. ⁹¹ Other artillerymen faced with the same mind-set were more philosophical, reminding themselves that artillery was a supporting arm and everything it did was to facilitate the infantry closing with the enemy. Herbert Uniacke, fresh from directing the Fifth Army's artillery through a long year of battles, wrote a twenty-one-page report on artillery developments that year, reviewing various technical and tactical developments. He concluded by reminding readers of the ultimate purpose of the artillery's war: helping the infantry to "gain their objective with the minimum of loss—*always bearing in mind that the final decisive factor is the bayonet of the Infantry soldier.*" ⁹² Uniacke also pointed out the futility of infantry attacks across boggy ground, but phrased his arguments oddly. The artillery fired barrages at the rate the infantry asked, and so Uniacke's comment was that there was no point in attacking if the barrage would be slower than 100 yards in 6 minutes. If the infantry could not struggle forward any faster than that, the Germans would have plenty of time to reorganize or prepare a counterattack regardless of the strength of the British attack and barrage. Uniacke was complaining about attacking through horrendous mud, but doing so in a roundabout way. There was no doubt he would fire such a barrage if asked—during Passchendaele he did—but he pointed out that it was not sensible.

Perhaps some of the infantry obsession with barrages stemmed from the fact that they lost their 'own' batteries, the ones that brigade or division commanders could allot. These were replaced with guns under central control. ⁹³ These extra guns, up to a third of the barrage, were "superimposed," that is, supplementing the ordinary barrage until switched onto special targets. These targets might be centers of resistance, counter-attacks, or German guns that revealed themselves. The advantages of centralized control were two-fold. Information could come from any number of sources, including aeroplanes, balloons, artillery observers, or the infantry themselves. Previously it had been up to the infantry to request the support and, brutally, the infantry units that most needed support were least able to request it. Secondly, artillery was not wasted sitting still while waiting for a target to be reported, but was already thickening the barrage. ⁹⁴



The final battle of 1917 saw a considerably different barrage than had previously been used. At Cambrai, surprise was the key element. Since the surprised Germans had no time to man intermediate positions between the trench lines, a creeping barrage was unnecessary. Instead, the Third Army organized a lifting barrage that shelled each German trench in turn; this also generally kept the barrage a few yards further from the British infantry and the vulnerable tanks, which did not want to drive into the barrage.

⁹⁵ ([Map 9](#) shows part of the barrage at Cambrai.) Despite seeming to represent a step backwards, the barrage functioned smoothly and there were no complaints about the method.

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Anticipating a breakthrough, steps were taken for artillery support beyond the barrage. A new method was devised, combining the pre-Somme plans for cavalry pursuit with the experience of the advance to the Hindenburg Line. Cavalry divisions would have their own horse artillery batteries and a few additional 4.5-inch howitzer batteries, but now these guns would take part in the initial barrage. ⁹⁶ The leading infantry divisions also received extra batteries, but of 6-inch howitzers and 60-pounder guns. ⁹⁷ These had shown adequate mobility and had been very useful during the advance to the Hindenburg Line, and they proved it again along the Canal du Nord. Large shells had considerable morale effects, and 'persuaded' isolated German groups to withdraw or surrender. But the breakthrough at Cambrai was illusory, the surprise temporary, and the battle dragged on with different artillery methods. Without surprise, and with the tanks broken down, ordinary artillery methods were needed. But as the guns advanced from pre-surveyed battery positions, they could not fire a predicted barrage. Typical 1917 conditions returned after a single morning's blip.

1918

1918 began with the BEF on the defensive, and thus with little call for offensive barrages. During the desperate fighting to repel German attacks, organized barrages were few and far between. British counter-attacks were generally small affairs and artillery support—if any—was provided by a few guns firing either over open sights or at specific targets. The few relatively large counter-attacks were organizational nightmares, because the artillery was accustomed to the trench-warfare pace of planning. It had become so wrapped up in paperwork that there were forms to fill out for each gun in a barrage. ⁹⁸ In trench warfare, such preparation reduced the number of shells falling on friendly infantry (and thus reduced complaints), but there was no time to engage in such detailed planning for the counterattacks of 1918. Creeping barrages were time-consuming for planning staffs and also required many supporting elements that were rarely present in even semi-mobile warfare. ⁹⁹ They required vast quantities of ammunition, which was difficult to arrange for the right place and the right time when everything was moving—batteries, command posts, and ammunition resupply points alike. Communications were severely disrupted once the networks of buried cable that trench warfare both required and facilitated had been left behind. Commanders had to organize what support they could through runners, gallopers, and whatever telephone links were hastily laid. One officer tersely summed up: "the more [telephone] wire you give us the more Huns we shall kill." ¹⁰⁰

All this did not mean that counter-attacking infantry fought alone. If conditions were difficult for the British artillery, the Germans suffered too. Their communications were just as bad, and their supply situation was worse. Most importantly, they were not in strong defensive positions; if there were no trenches for them to defend, they became correspondingly vulnerable, and thus a weaker British barrage could have adequate results. World War I casualty figures are hard to pin down, but it was about as costly to defend as to attack. The German attacks of 1918 had the chance to win the war, but their failure ripped the heart out of the German infantry not only in morale but in sheer numbers.

Once there was a rough equilibrium on the Western Front, the BEF began making small attacks. These attacks varied, with some launched to seize strong positions, others to exploit weak ones. The bombardments correspondingly varied, but the barrages had less variation. The minor attacks were always heavily supported with dense barrages.

The German infantry involved were often of poor quality, willing to surrender if they could find a reason, and the intense barrages provided an excuse to stay in their foxholes and surrender rather than fight.

While they were heavy, barrages were pragmatic, adapting to local circumstances and using whatever pace and munitions (gasses, smoke, HE, and/or shrapnel) promised most effect. There was no BEF-wide formula.

¹⁰¹ In virtually all cases there was no exploitation of these minor attacks, so the Royal Artillery did not plan for batteries to exploit nor plan how to provide fire support in an advance.



When it came to a major attack, with a goal of breaking through a main German line and exploiting through the hole, the situation was somewhat different. The organization was little altered—field artillery fired a creeping barrage, heavy artillery fired on more distant targets—but the barrages would be thinner, because on the broader fronts involved there were not enough guns to provide fire as dense as in the small attacks. GHQ warned the armies that the heavy concentrations so typical of 1917 could not be repeated and therefore the infantry would have to do more fighting themselves. ¹⁰² Also, when the goal was to move through the German lines rather than just occupy a portion of that line, the Royal Artillery had to support the exploiting troops. In 1917 this had been difficult since, to be safe from German guns, the field artillery had to be well behind the front lines and thus could not fire deep into German positions. The ruined landscapes also prevented artillery from advancing quickly and providing close support. In 1918, British attacks had the advantages of surprise or artillery superiority, or both. Barrage guns could therefore be placed further forward, providing deeper coverage right from the start. But even that was not enough once penetration of German lines was measured in miles instead of hundreds of yards.

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Mobile artillery support was necessary, and it took several forms. Some artillery brigades would be earmarked to move forward early in a battle. Typically these would be the superimposed brigades, so the barrage was not weakened when they moved. Other brigades would then leapfrog forward, and the creeping barrage would be continuous. Although it would be continuous, after only a few minutes it thinned and became more ragged as batteries moved forward, got lost or were delayed, or ran low on ammunition, but the gamble of lessened support was worth taking because the Germans would be retreating. Sometimes the infantry's first objective would be the furthest line on which a full barrage could be fired, and thereafter mobile artillery was the only support. ¹⁰³ There were times when this was not enough support, especially for breakthrough forces like cavalry. Horse artillery batteries would be attached to forward regiments or brigades, but some artillery officers complained that even horse artillery batteries could not move fast enough. ¹⁰⁴ They also complained that the cavalry commanders had to coordinate with the artillery and machine-gun units, which shows how out of touch some cavalry officers were: they wanted to solve tactical problems on their own rather than using combined arms. It was a throwback to pre-war attitudes that had survived longer in the cavalry because the cavalry had seen less action than the infantry.

Some infantry formations adopted similar steps, and in some cases a field battery would work with each infantry brigade, not plunging into the front line but staying close behind it and using observers and indirect fire. ¹⁰⁵ Sometimes this was still not enough to deal with local strongpoints, and a pair of guns would be attached to a battalion, fighting forward in the thick of things. ¹⁰⁶ For the times when close support was impossible, the guns simply

ceased fire, creating shell-free areas where the infantry or cavalry used their own skills to advance, neither supported by artillery fire nor constrained by friendly fire. ¹⁰⁷ It was a remarkable demonstration of the BEF's confidence in the fighting qualities of the infantry.

Whenever the Germans occupied solid defensive positions, the BEF wisely paused and mounted a deliberate attack to break the position. ¹⁰⁸ This involved a bombardment and a full series of barrages, just as in 1917, to demoralize, weaken, and confuse the defenders. The difference came after the initial phase of such battles, after the main resistance had been broken. Now there was more chance of exploitation and less chance of major German counter-attacks, so artillery support was modified. Barrages were fired until the infantry cracked the German line, then the artillery fired concentrations on key terrain features to deny them to the Germans rather than to aid British capture. Infantry would operate around these points, using their own tactical sense rather than having to follow an even-paced barrage. This could be considered infiltration tactics, if indeed the BEF is to be credited with any.

More time was spent pursuing the Germans than turning them out of defensive lines, and trench-warfare tactics had to be adapted to suit the circumstances. Barrages were often very thin, as much guiding the infantry advance as protecting them. In this regard smoke shells or the few incendiary shells that were available were especially useful. ¹⁰⁹



Frequently there was little time to prepare detailed barrage maps, and the barrage would be fired parallel to some simple terrain feature such as a road, with the infantry conforming to the barrage rather than the reverse. Thin barrages were no problem with the Germans in weak positions; frequently they were just resisting wherever they happened to have spent the night. Goaded by Haig, armies urged greater speed in the

advance, complaining that the infantry relied too much on a barrage and not enough on their own weapons. ¹¹⁰ Some armies standardized their barrages so that corps and divisions could operate interchangeably and not waste time fine-tuning barrages when there was little to be gained from the extra effort. ¹¹¹ While infantry leapfrogged forward, field artillery was more continuously engaged, so there were usually at least two divisional artilleries backing each division in the line. This was no challenge for the CRAs, who had dealt with more field artillery in 1916 and 1917. However, in the mobile fighting of 1918, some heavy artillery was attached to most divisions. Generally each division got a "Mobile Brigade RGA" composed of two batteries of 6-inch howitzers and two batteries of 60-pounder guns. ¹¹² Corps might retain some authority over these guns, mostly regarding counter-battery work, but the bulk of the time the CRA was in control. ¹¹³ Thus the division was itself firing not only a creeping barrage but organizing the distant fire on specific targets that corps headquarters had previously handled.

In addition to creeping barrages, the infantry regularly needed close support. Training over the previous winter had improved the artillery's standard of mobility, and the spring retreats gave practical experience in mobile warfare, even if it was in moving backwards. Training continued in the early summer, especially emphasizing mobile operations, so the field artillery was generally quite capable. There were still plenty of wartime volunteer officers who had no personal experience of what the lecturers (who were usually Regulars) tried to drum into them, so aggressive use of field guns was a patchy affair. ¹¹⁴ However sporadic, it was the right thing to be doing, and there were exhortations to read the relevant sections of *Field Artillery Training*. Uniacke, now Deputy Inspector General of Training and specifically responsible for artillery training, rushed out leaflets encouraging direct support, hoping that experience was more persuasive than *FAT's* theories. ¹¹⁵ Repeated printings of the leaflets, however, suggest the lessons were not reaching everyone. On the other hand, there were subalterns who blithely meandered across the battlefield with their guns, doing as they saw fit, ignoring and enraging infantry

commanders. When heavy artillery was pushed forward, it seldom engaged over open sights and was generally better behaved, shooting where it was asked. ¹¹⁶ In the very last days of the war there was no need for barrages, and only minor need for much fire support at all. By October, barrages were a rarity in the Fourth Army, generally only going a few hundred yards and then giving way to close support batteries, including sections of 6-inch howitzers advancing as far forward as the 18-pounder batteries. ¹¹⁷ British spearheads were stretching the lines of supply to the breaking point, and artillery ammunition was declining on the list of priorities since the infantry did not need as much artillery support. Many batteries were put into reserve, which generally meant two things: the horses were taken away to help other units, and the men were put to work mending roads.

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Throughout 1918, most senior officers recognized that three things could make the infantry's job easier. Air support, tanks, and artillery were supporting arms, sometimes referred to as auxiliaries. Aeroplanes depended on the weather and had only limited bomb loads; tanks were mechanically unreliable and constantly nagged the Royal Artillery for protection. At one point they even asked the gunners to deal with "all anti-tank devices," asking for more support than the infantry ever had. ¹¹⁸ Artillery was the most reliable and most powerful aid to the infantry, but it could not do everything. Intelligent commanders thought in terms of the supporting arms reducing infantry losses, a vital point to a diminishing BEF. Infantry brigades had been trimmed from four to three battalions at the beginning of the year, and the battalions were still not up to strength, even with callow youths and half-fit older men. Under the circumstances, commanders leaned on the artillery to do as much work for the infantry as possible. As Birch wrote, "All Army Commanders are at me not to reduce the Artillery and say with the present state of the infantry they cannot do with a gun less...." ¹¹⁹ This was quite true, but there were still limits on what artillery could do.

Taking for example the battle of Valenciennes just ten days before the Armistice, the Canadian Corps assembled perhaps the heaviest artillery support for any small attack in the war. ¹²⁰ After a punishing bombardment, the German lines were swept by barrages from all directions: frontal, enfilading, and even reverse barrages. Fire was calculated so that, theoretically, no German infantryman could survive. Naturally some did, and the infantry took roughly one-third casualties. ¹²¹ Losses were low in absolute terms—501 Canadians—but not in percentages. This was not an unusual figure for infantry losses in any war, so the artillery was not necessarily reducing the rate of casualties. What artillery did was reduce the number of infantry needed, and by doing that it reduced the overall casualty numbers. Artillery fire could be used, for example, to deny the enemy a hill at a crucial time, rather than the infantry having to storm the hill. This sort of theory was, however, going far beyond what was being said in 1918. Most commanders simply used artillery as they had been taught to use it (if they had received formal instruction), or adapted intelligently.

Conclusion

Thus the use of barrages came nearly full circle in the war, back to providing close support by direct fire over open sights. Since simply bombarding before an attack and then switching to other targets proved fatally inadequate, barrages were developed to provide covering fire during the infantry assault. The success was obvious; attacks never failed due to a too-heavy supporting barrage. Details always varied to match local conditions, but the principle was never in doubt. As German tactics changed, so the barrage changed, to the point where a light bombardment and a heavy barrage would be indistinguishable. Increasing sophistication in infantry tactics, artillery tactics, and more importantly in combined-arms tactics allowed a shift back to concentrations of fire, away from a linear barrage. By the end of the war, tactics lifted from *Field Artillery Training* and *Field Service Regulations* reappeared, but with barrages available if they were needed.

What happened between 1914 and late 1918, however, was primarily a pragmatic adjustment. It was pragmatic in a way that bombardments were not, for while there was frequently pressure from high commanders to adjust bombardments to fit a strategic conception, there was vastly less pressure to adjust the pace of barrages. Two reasons can be advanced to partially explain this difference. Bombardments were the opening acts of major battles and planned at high levels. They were thus subject to intense pressure to fit with strategic objectives. On the other hand, barrages were planned one or two levels lower, and high-level intervention would have been inappropriate. Second, if there had been such intervention, lower-echelon commanders would have a sheaf of local detail to bolster their arguments. If we follow Tim Travers' arguments about the role of personality in British senior commanders, [122](#) the explanation is plausible that senior officers did not want to enter arguments with better-informed subordinates: the senior could easily lose the argument and thus face, even if they used their authority to override objections.

Throughout the war the artillery supported infantry attacks in every way possible. Artillery officers offered suggestions on better ways to conduct operations, but when there were conflicts they fell into line with the wishes of the troops who would ultimately be doing the fighting.

Notes:

Note 1: See the 1965 letters of H. H. Gardiner (RAI military document 509), whose enthusiasm led him to credit A. F. Brooke. Gardiner later retracted this claim, which seems to have been made without foundation. [Back.](#)

Note 2: This was four days before the battle of Crecy, the first time an English army used gunpowder weapons in battle. A. F. Becke "The Coming of the Creeping Barrage," JRA 58:1 (1931): 19. Entire article is available as [Appendix 41](#). [Back.](#)

Note 3: *FAT 1914* §157, ¶2. [Back.](#)

Note 4: *Ibid.*, ¶6. [Back.](#)

Note 5: *Ibid.*, ¶6. [Back.](#)

Note 6: Bethell, *Modern Artillery in the Field*, 345, 139. [Back.](#)

Note 7: Maxse Papers, file 11/2. [Back.](#)

Note 8: WO95/1390, (3rd Division CRA), August 1914. This could have unforeseen effects, as for the 15 Brigade RFA, affiliated to the 14th Infantry Brigade during the retreat from Le Cateau. The infantry brigadier's orders had been not to retreat, which led the RA brigade commander to decline another officer's orders to retire. CAB45/198, C. F. Stevens to Edmonds, n. d. New Army divisions (like Maxse's 18th) could be trained this way too. [Back.](#)

Note 9: 18-pounders were preferred for barrages all through the war, very largely because they fired shrapnel. In 1914, *FAT* steered gunners towards 18-pounders by suggesting that more firepower should be generated by an increased rate of fire rather than an increased number of pieces firing. Guns with fixed ammunition can fire faster than separate-loading howitzers, like the 4.5-inch. [Back.](#)

Note 10: 15 September 1914, WO95/1521 (5th Division CRA). [Back.](#)

Note 11: WO95/1510 (5th Division GS) 26 December 1914; WO95/1521, 16 January 1915. [Back.](#)

Note 12: WO158/200 (Second Army Plans), 18 February 1915. [Back.](#)

Note 13: Buller's fighting around Hlangwane featured what I believe is the first battlefield use of telephones to direct artillery fire. [Back.](#)

Note 14: "General Principles for the Attack," 13 April 1915, WO95/155; available as [Appendix 7](#). [Back.](#)

Note 15: Prior and Wilson, *Command on the Western Front*, 77-99. [Back.](#)

Note 16: WO95/1581 (6th Division GS), WO95/1588 (6th Division CRA). This may well not be the first example of a lifting barrage; I stumbled across the orders while doing a survey of three infantry divisions' CRA war diaries. While I read all corps-level artillery files, I read only three CRA war diaries: 6th Division, 9th (Scottish) Division, and 41st Division. [Back.](#)

Note 17: Ibid. [Back.](#)

Note 18: *OH 1915*, vol. 2, 454, 467; WO95/1683 (8th Division CRA diary), BX/25 c. 20 September 1915; WO95/3934 (Meerut Division CRA diary) "Scheme C," 23 September 1915; WO95/88 (No. 2 HARG) V Corps GX2568, 14 September 1915; WO95/1881 (14th Division CRA), 25 September 1915. [Back.](#)

Note 19: Second Army MGRA letter EL1, 12 September 1915, WO95/745. [Back.](#)

Note 20: He was next sent to the Ministry of Munitions before returning to corps command in 1916 to 1918, something he did with competence but little flair. [Back.](#)

Note 21: E.g., R. S. Hardman, who credits Horne with the creeper and E. W. Alexander with the details (CAB45/116, 30 March 1930), while Alexander (CAB45/137) credits C. E. D. Budworth. Headlam credited the French, entirely omitting his own earlier ideas about attacking in the open. Headlam to Rawlins, 26 January 1919, Rawlins Papers. [Back.](#)

Note 22: Becke ("Creeping Barrage," 24) suggests the French were not using a *barrage mobile* at the opening of the battle of the Somme, but the French XX Corps in August 1915 were ordering their artillery to "lengthen its range, little by little ... so as to form a barrage in front of the assaulting troops." It does not appear to have been uniform practice in the French army. Third Army War Diary, 25 August 1915, WO95/359. [Back.](#)

Note 23: CDS24, "Object and Conditions of Combined Offensive Action," June 1915; emphasis in original. Whatever GQG said, there is no good evidence the French were using a creeping barrage. See Maxse Papers, IWM, file 23 for comments on French supporting fire on the Somme. [Back.](#)

Note 24: CDS50, "Tactical Notes," 31 July 1915. [Back.](#)

Note 25: See also *OH 1915*, vol. 2, 173, n. 4. [Back.](#)

Note 26: Becke, "Creeping Barrage," 24. [Back.](#)

Note 27: *OH 1915*, vol. 2, 467. [Back.](#)

Note 28: *OH 1915*, vol. 2, 454-5, 467. [Back.](#)

Note 29: Maxse Papers, IWM, file 15, conference notes, 13 October 1915. [Back.](#)

Note 30: "Some Artillery Lessons to be learnt from the Recent Operations in September-October 1915," Advanced First Army, 7 November 1915, Rawlinson Papers, NAM. The

suggestions were repeated by field-grade officers at a 'college' or symposium, but were issued with the express disclaimer "These notes are not official," rather than as an SS pamphlet. WO33/756, "Notes on Artillery," June 1916. [Back.](#)

Note 31: On barrages on the opening day of the Somme, see Becke, "Creeping Barrage," for an excellent exposition. Becke's work, within the limits he set himself, is definitive. [Back.](#)

Note 32: Fourth Army operations papers vol. 4, conference 16 April 1916. Fourth Army GX3/1P, 5 June 1916; Fourth Army operations papers, vol. 7. [Back.](#)

Note 33: The first standardized system for marking bombardment maps seems to have been laid down in November 1916 (SS133, untitled). There must have been some rough-and-ready system previously in existence, or else co-operation would have been even worse than it was. [Back.](#)

Note 34: One source enthusiastically claimed that III Corps had developed the creeper "to a fine art" before 1 July. Perhaps, but III Corps fared badly. H. W. L. Waller to Edmonds, 18 April 1930, CAB45/138. VIII Corps also crept back, at precisely the pace expected of the infantry advance, which proved too sanguine and sanguinary. WO158/410. [Back.](#)

Note 35: Becke, "Creeping Barrage," 29-30. [Back.](#)

Note 36: E.g. Budworth's "Remarks based on Recent IVth Corps Artillery Operations," 6 October 1915, which flatly declared, "The Artillery plan ... should be a Corps Artillery plan." This was picked up by Archibald Montgomery in his "Lecture on Battle of Loos" (n. d., but early December 1915), but less so by Rawlinson in "Artillery Lessons of Loos" (9 October 1915). All are in the Montgomery-Massingberd Papers, LHC, files 6/4 and 7/1. [Back.](#)

Note 37: GHQ to Reserve Army, 4 June 1916, WO158/245. [Back.](#)

Note 38: As best as can be determined, the first formal denunciation of intense fire was in Fourth Army 32/3/98(G), 16 August 1916, (Fourth Army Operations Papers, volume 7), which forbade intensification or slackening of fire at Zero. See also *OH 1916*, vol. 2, 567. [Back.](#)

Note 39: Prior and Wilson, *Command on the Western Front*, 203-26. [Back.](#)

Note 40: Divisional artillery establishment varied between New Army, Regular, and Territorial Force divisions. See Sir Martin Farndale, *History of the Royal Regiment of Artillery, Western Front 1914-18* (Woolwich: The Royal Artillery Institution, 1986), 348-9. [Back.](#)

Note 41: Becke, "Creeping Barrage," 35-6. [Back.](#)

Note 42: *Ibid.*, 37. [Back.](#)

Note 43: OA256, 16 July 1916, quoted in Becke, "Creeping Barrage," 38. [Back.](#)

Note 44: SS119, July 1916. [Back.](#)

Note 45: OAD169, 5 October 1916, in Haig Diary. [Back.](#)

Note 46: Fourth Army Papers, vol. 5 "... Tactical Employment of Tanks (Provisional)," August 1916. See XIV Corps BGRA (WO95/915) 12-15 September 1916, for how the two arms first co-ordinated. [Back.](#)

Note 47: E.g. Haig Diary, 4, 5, and 20 August 1916. [Back.](#)

Note 48: An example would be following the details through the Maxse Papers, IWM, files

17-27. [Back.](#)

Note 49: Maxse Papers, IWM, file 23, contains details of French practice in October 1916. Haig Diary, 20 August 1916. Letter 305/2(G), 30 December 1916, Fourth Army to GHQ (Fourth Army Operations Papers, volume 21). [Back.](#)

Note 50: *OH 1916*, vol. 2, 295, n. 2. Developments took place at different times in different corps. II Corps performed their first multi-line creeping barrage in late October, while V Corps was very sophisticated shortly after joining the Reserve Army. II Corps BGRA WO95/651, 18 October 1916; V Corps BGRA WO95/756, October 1916. [Back.](#)

Note 51: *OH 1916*, vol. 2, 395, 479. [Back.](#)

Note 52: *OH 1918*, vol. 4, 197. [Back.](#)

Note 53: Haig Diary, 8 October 1916; letter, GA43/0/4, 16 September 1916, WO158/344. [Back.](#)

Note 54: E.g. the 8th Division's "Instructions for Artillery ... in Liaison with Infantry," 25 June 1916, WO95/1684. [Back.](#)

Note 55: GA15/0/1, 14 July 1916, WO158/344. [Back.](#)

Note 56: Only very occasionally was a reserve of guns held, as in XIII Corps. *OH 1916*, vol. 1, 158. 18th Division Operations Order 66, 27 October 1916, Maxse Papers, IWM, file 64; WO158/419. A battery of 6-inch howitzers was standard, at least in XIV Corps, by the end of September 1916. Sometimes the CRA controlled the 4.5-inch howitzers as well, with only 18-pounders firing the barrage; *ibid.*, XIV Corps Artillery Operations Order 18, 11 September 1916, WO158/419. [Back.](#)

Note 57: SS120, "... Co-operation between Aeroplanes and Artillery During an Advance," September 1916; and SS124, "Notes for Artillery Officers on Shoots with Aeroplane Observation" (August 1916). [Back.](#)

Note 58: SS139/4, February 1917 and later reprints. [Back.](#)

Note 59: GHQ Artillery Circular No. 5, "Technical Notes on 18pr Barrages," 26 March 1917 (Headlam Papers). Presumably this represented a codifying of ideas already incorporated in the Arras barrages rather than last minute alterations. [Back.](#)

Note 60: "Artillery Notes and Statistics, Battle of the Somme, June to November 1916," November 1916, Rawlinson Papers, NAM. [Back.](#)

Note 61: See WO95/432, 30 March 1917 for details. [Back.](#)

Note 62: SS156 (April 1917), "Notes on Recent Operations, Compiled by GS Fourth Army." [Back.](#)

Note 63: In early 1917, the protective barrage might be only three to four hundred yards beyond the objective. Third Army Artillery Instruction 13, 19 April 1917, WO158/312; WO106/399, "Canadian Corps Artillery Instructions for Vimy." [Back.](#)

Note 64: The Second Army noticed this in January 1917, predicting the German tactic before it was sprung on the British and long before the Second Army could have experienced it. WO158/18, 30 January 1917. The 18th Division had suggested it on 12 September 1916. 18th Division AB/[none], Canadian Corps BGRA diary WO95/1059. [Back.](#)

Note 65: Haig Diary, 12 May 1917. Haig pressed his army commanders to deepen and think through their barrages at a conference on 30 April 1917: OAD426, Fourth Army

operations papers, vol. 21. The Third Army had hints of a deeper creeping barrage two days before this, and on the 30th it ordered smoke barrages to blind machineguns and a protective barrage five hundred to one thousand yards beyond the furthest objectives. Third Army Artillery Instructions 16, 17; WO158/312. [Back.](#)

Note 66: For full details, Second Army G140, "General Principles on which the Artillery plan will be drawn," 29 August 1917, WO158/208. [Back.](#)

Note 67: There had been smoke bombs for 4-inch Newton mortars since the battle of Loos, but the range of these mortars was too limited to allow them much effect in large battles. The Fourth Army suggested smoke shells for artillery in October 1916; presumably this helped encourage production. WO95/431, 13 October 1916. [Back.](#)

Note 68: The excuse was the "alignment of enemy trenches." Sir Hugh Tudor Diary, RAI military document 1167 (hereafter Tudor Diary). The *OH* gracefully glides over the situation; see *OH 1917*, vol. 1, 227, n. 2. [Back.](#)

Note 69: Tudor Diary. Tudor claimed XVII Corps suppressed the report when they saw that it would get them in trouble, but the XVII Corps diary puts a different 'spin' on the question; WO95/942, 16-19 April 1917. [Back.](#)

Note 70: OAD402 (Army Commanders' Conference, 16 April 1917); smoke was to be used to blind a valley between two attacks. Fourth Army operations papers, vol. 21. [Back.](#)

Note 71: Sometimes there was further division of the artillery, with a division forming two artillery groups, one supporting each infantry brigade. CAB45/118, C. A. L. Brownlow to Edmonds, "Notes on Cambrai," n. d.; CAB45/116, C. G. Stewart to Edmonds, n. d.. [Back.](#)

Note 72: The 15th Division did this after their first objective at Arras; the 37th Division (nominally an exploiting division) did so after the third objective. Field-Marshal Sir John Dill Papers, LHC, files 1/3/1-2. [Back.](#)

Note 73: See I. V. Hogg and L. F. Thurston, *British Artillery Weapons & Ammunition 1914-1918* (London: Ian Allen, 1972) for the improvements in artillery equipment. [Back.](#)

Note 74: On German defensive tactics see G. C. Wynne, *If Germany Attacks: The Battle in Depth in the West* (London: Faber & Faber, 1940); and Timothy Lupfer, <http://www-cgsc.army.mil/carl/CSIPUBS/Lupfer/lupfer1.htm>. Deeper barrages also forced counter-attacks to assemble further back, and the assembly areas would also be shelled. Birch to Hunter-Weston, 4 May 1917, Anstey Papers. [Back.](#)

Note 75: Steps did have to be taken against counter-attacks, for instance detailing aeroplanes with a direct call to some batteries to watch for assembling German troops. GHQ OA715, 1 May 1917, WO95/363. [Back.](#)

Note 76: The Fifth Army's barrages in September-October can be traced in WO158/250 (operations correspondence with GHQ); V Corps' are found in WO95/756. [Back.](#)

Note 77: Hugh Tudor thought the battle of the Menin Road Ridge could be fought immediately after barrages, with a bombardment superfluous. Tudor Diary, September 1917. [Back.](#)

Note 78: However, see *OH 1917*, vol. 2, 71. [Back.](#)

Note 79: Maxse Papers, IWM, file 33. [Back.](#)

Note 80: XIV Corps BGRA WO95/916, 12 August 1917. [Back.](#)

Note 81: Fifth Army GA43/0/4, 16 September 1916. [Back.](#)

Note 82: Neil Fraser-Tytler, *Field Guns in France: With a howitzer battery in the battles of the Somme, Arras, Messines & Passchendaele 1915-1918* (Brighton: Tom Donovan, 1995), 181. [Back.](#)

Note 83: See V Corps, WO95/756, 16 September 1917, and for Second Army methods in general. [Back.](#)

Note 84: The Fifth Army was modifying its artillery tactics as fast as, or faster than, the Germans. See Uniacke's "Attack Barrages, as modified by the enemy's latest tactics," (RA225, 25 August 1917, Maxse Papers, IWM, file 35/3); and Rawlins, *History*, 141-5, 152-6. [Back.](#)

Note 85: Haig Diary, 7 October 1917. [Back.](#)

Note 86: Historical Sub-Section, General Staff, American Expeditionary Force, *A Survey of German Tactics, 1918* (Washington, DC: Government Printing Office, 1918). [Back.](#)

Note 87: II Corps G1266, 19 September 1916, WO158/344. [Back.](#)

Note 88: See, e.g., Byng's GS50 (10 August 1917; WO158/311), and the constant calls for improved marksmanship. [Back.](#)

Note 89: *Die Angriff im Stellungskrieg*, translated as SS748 "The Attack in Position Warfare," October 1918. On American tactics, see James W. Rainey, "The Questionable Training of the AEF in World War I," *Parameters* 13:3 (1983) 34-46; and "Ambivalent Doctrine: The Tactical Doctrine of the AEF in World War I," *Parameters* 22:4. 22:4 (1992), 89-103. [Back.](#)

Note 90: XVIII Corps GS69 to Fifth Army, 12 August 1918, Maxse Papers, IWM, file 35/4. [Back.](#)

Note 91: Anstey galley proofs, 140: "This is my aunt," if Anstey has not bowdlerized the comments. [Back.](#)

Note 92: Uniacke papers, VII/2; emphasis in original. [Back.](#)

Note 93: Guns allotted to divisions survived as late as Messines, with each division having two 18-pounder batteries, and a battery each of 4.5-inch and 6-inch howitzers. One interesting transitional feature of Messines was having a few heavy guns per division that would deepen the barrage where locally necessary. WO158/413 [Back.](#)

Note 94: SS131 details RFC co-operation and also reflects better command links. [Back.](#)

Note 95: CAB45/137, T. A. Tancred to Edmonds, 3 April c.1935. Tancred was BGRA of III Corps at Cambrai. [Back.](#)

Note 96: The 4.5-inch batteries even received extra horses to improve their mobility. A horse shortage had developed by early 1917, and the RHA were the only units to retain their pre-war horse strength and hence mobility. [Back.](#)

Note 97: *OH 1917*, vol. 3, 29. [Back.](#)

Note 98: Army Form W3981, "Barrage Table for No_ Gun," which was filled out for each gun; RAI military document 1348. [Back.](#)

Note 99: One corps could prepare a creeper in nineteen hours by August; during the battle of Villers-Bretonneaux (April), estimates were around twenty-four hours. F. Fitzgibbon to Edmonds, 16 October 1938, CAB45/185; *OH 1918*, vol. 2, 397. [Back.](#)

Note 100: WO158/343. [Back.](#)

Note 101: Compare the attacks at Meteren and Hamel; *OH 1918*, vol. 3, 200-11. [Back.](#)

Note 102: OAD291/33/1, 11 June 1918; G. P. Dawnay Papers, IWM. Here Haig's words to his army commanders were prepared by the artillerymen; the draft is in S. W. H. Rawlins' handwriting. Rawlins Papers, file 11, 9 June 1918, available as [Appendix 42](#). [Back.](#)

Note 103: E.g. Fourth Army 220(G), 21 July 1918. Fourth Army operations papers, vol. 49. [Back.](#)

Note 104: Cavalry Corps, "Notes on Recent Operations No. 5," 24 August 1918; Fourth Army operations papers, vol. 65. [Back.](#)

Note 105: Some were urged on by senior commanders, like Rawlinson: "We are now engaged in open warfare when the fire of guns—both Field and Heavy—has to be directed largely from direct observation and on the initiative of subordinate Commanders." Fourth Army GS20/14(G), 27 August 1918; Fourth Army operations papers, vol. 49 [Back.](#)

Note 106: Canadian Corps had an elegant plan whereby each battalion worked with one battery. Four guns would operate as a unit with indirect fire while the remaining section provided direct fire support. "Artillery Notes on Attack by Canadian Corps, August 8th 1918," WO95/1060. [Back.](#)

Note 107: Fourth Army 20/36(G), WO158/242, 7 October 1918; II Corps BGRA, 22 September 1918, WO95/653. [Back.](#)

Note 108: At least one division warned its advanced guard not to attack bald-headed but let the CRA organize proper support. The advanced guard had an 18-pounder battery, and the "vanguard battalion" only two guns, whilst the CRA had four brigades of field artillery and a brigade of heavy artillery. Staff College Syndicate Report 1927/7, "Battle of the Selle." The Fourth Army issued a similar warning to corps in October: WO95/439, 23 October 1918. [Back.](#)

Note 109: III Corps Narrative, 18 September 1918-11 November 1918, Fourth Army operations papers, vol. 63 (henceforth III Corps Narrative). Incendiary shells had been tried several times and found wanting in ordinary circumstances. There was little enough to set alight in most 'woods' on the Western Front. [Back.](#)

Note 110: Haig Diary, Army Commanders' Conference, 11 June 1918. [Back.](#)

Note 111: For the Fourth Army, see Montgomery-Massingberd Papers, files 7/25 and 7/28, or III Corps BGRA WO95/694, 20 August and 12 September 1918; Fifth Army Artillery Instruction No. 120, 7 November 1918, WO158/254. [Back.](#)

Note 112: The Third Army specifically warned against attaching too much heavy artillery. WO95/372, 30 August 1918. [Back.](#)

Note 113: This worked much better when the division had a heavy artillery brigade headquarters to handle the batteries. III Corps Narrative; Fourth Army GS 262(G), 2 September 1918, "Control of Heavy Artillery in Moving Warfare." [Back.](#)

Note 114: E.g. Lecky's bitter RA/3259 of 17 June 1918. This could be as much an infantry as a artillery problem; the infantry had adapted themselves to trench warfare too. Staff College Syndicate Report 1929/11, "Operations, 4th Army, August 1918 (Special Reference Canadian Corps)." At this point the artillery allocation for a battalion was a section of guns and a few mobile trench mortars. [Back.](#)

Note 115: Haig jumped on the bandwagon as soon as he saw the leaflets; Haig Diary, 23 August 1918. It is not necessary for a commander-in-chief to be the fount of all wisdom, and Haig supported a good idea when it came to him. [Back.](#)

Note 116: C. G. Fuller to Edmonds, 10 December 1939, CAB45/188. III Corps was pushing heavy artillery forward ahead of the Fourth Army's suggestions during August and September 1918. [Back.](#)

Note 117: XIII Corps Narrative, 3 October 1918-11 November 1918; Fourth Army operations papers, vol. 64. [Back.](#)

Note 118: WO158/855, "Co-operation of Tanks with other Arms," n. d., but very late 1918; see also Fifth Army SG671/9 of 7 August 1917, Maxse Papers, IWM, file 35/4. Smoke proved useful, and various special methods were adopted such as assigning aeroplanes to watch for anti-tank guns, with the authority to call on 60-pounder batteries. Tanks were, and are, not in themselves decisive. [Back.](#)

Note 119: Birch to Deputy Chief of the Imperial General Staff (Harington), 18 May 1918, Anstey Papers. The specific circumstances were combing through the anti-aircraft gunners in England, foreshadowing the 'remustering' of 1944-45. [Back.](#)

Note 120: A. G. L. McNaughton "The Capture of Valenciennes: A Study in Co-ordination," *Canadian Defence Quarterly* 10:3 (1933): 279-94. [Back.](#)

Note 121: Ibid. 294, n. 8; compare c. thirty-five percent casualties with figures in John Terraine, *The Smoke and the Fire: Myths & Anti-myths of War, 1861-1945* (London: Leo Cooper, 1980), 44, 47. There was a similar loss rate at Hamel, with surprise and tanks helping the attack rather than overwhelming artillery. SS218, "Operations ... against Hamel" [Back.](#)

Note 122: See Tim Travers, *The Killing Ground: The British Army, the Western Front & the Emergence of Modern Warfare, 1900-1918* (London: Routledge, 1987), especially parts one and two. [Back.](#)

["The Infantry cannot do with a gun less": The Place of the Artillery in the British Expeditionary Force, 1914-1918](#)