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FIGHTING THE BOCHE UNDERGROUND



Captain Trounce.

FIGHTING THE BOCHE UNDERGROUND

BY

H. D. TROUNCE

**FORMERLY OF THE ROYAL BRITISH ENGINEERS
NOW CAPTAIN OF ENGINEERS, U.S.A.**

WITH ILLUSTRATIONS AND DIAGRAMS

**NEW YORK
CHARLES SCRIBNER'S SONS
1918**

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CHAPTER I

INTRODUCTORY

IT has been frequently suggested to me that I write of my experiences at the front. As one of the advance-guard of the American army who participated in the great struggle for freedom long before the United States espoused the cause of the Allies, I am more than willing to do this, owing to my strong desire that the public should know something of the constant fighting which is going on *underneath* as well as on the surface and above the ground of the trenches both in France and elsewhere, especially if, by so doing, I can help the people at large more fully to appreciate the importance of the work and the unflinching devotion of that branch of the army which but seldom finds itself singled out for the bestowal of special honors or for the expression of public approbation.

This narrative will be mainly concerned with the engineers and sappers who are so quietly and unostentatiously undergoing extraordinary hardships and dangers in their hazardous work below the ground, in order that their comrades of the infantry may occupy them above, safe, at any rate, from underground attack. In no species of land warfare is a cool head and clear brain, combined with decisive and energetic action and determined courage, more required than in the conduct of these military mining operations.

The value of mines and of similar contrivances of the engineer is partly psychological. Though hundreds of men only may be put out of action by their use, thousands of valuable fighting men suffer mentally from the knowledge or from the mere suspicion that their trenches are undermined by the enemy. Such a suspicion causes the strain on their morale to be very severe and their usefulness to be correspondingly diminished.

The men engaged in this work do not receive that inspiration and access of courage which comes from above-ground activity and which enkindles and stimulates enthusiasm, as in a blood-stirring charge. This trench tunnelling and mine laying requires a different form of bravery: that unemotional courage which results from strong self-control, determination, and perseverance of purpose. The personnel of these engineer-mining regiments usually work in twos and threes, or in small groups, cramped in narrow galleries, sometimes 20, sometimes 200, feet below the surface; and often immediately under or beyond the enemy's front trenches. On numerous occasions they silently force their way underground, despite great difficulties and risk, to within a few feet of the enemy sappers, hardly daring to breathe. A cough, a stumble, or a clumsy touch only are necessary to alarm the enemy, cause them to fire their charge, and thus send another party of opposing soldier miners to the "Valhalla" of modern fighting men. In this war, enormous charges of the highest and deadliest explosives known to man are used. Instant annihilation follows the slightest mistake or carelessness in handling such frightful compounds. Always is there excitement in abundance, but its outward manifestation is of necessity determinedly suppressed. No struggle with a living and resourceful enemy comes to stimulate the soldier mining engineer; only a ghostly adversary has he to contend with, one who is both unresponsive and invisible until the final instant.

No part of such work can be hurried. Underground surveys are calmly and efficiently made, huge mine charges deliberately and quietly placed, electrical connections carefully tested, and at the precise moment fired with terrific detonation and damage. The earth is shaken for miles around, trenches are entirely buried with the *débris*, while companies of men are engulfed, and immense mine-craters formed.

During the progress of this war there has been a constant increase in the number of engineering troops and development in engineer equipment. While the organization of the German troops at the outset of the war included large numbers of engineer soldiers specially trained for military purposes, the number of engineer units in the British forces as well as those of our other allies was comparatively small.

The training of engineer troops among the Allies for use in trench warfare was extremely limited; their work was confined generally to the operations of open warfare.

Trench warfare changed the whole course of events and rendered necessary wide and sweeping changes in organization, training, and equipment. It has been often stated that this is a war of engineers, and it is certainly true. Engineers and engineering problems are found in every branch of the service.

Instead of being a small and comparatively unimportant corps in our great army machine, they are now of the first importance, and no operations of any magnitude are undertaken without including the necessary engineer forces.

In almost every instance careful liaison or co-operation must be effected with the infantry or other arms concerned in the operations.

I can hardly begin to enumerate the different activities of engineers in trench and open warfare.

Some of the most important work done by them in this trench warfare includes the construction, repair, and general maintenance of all trenches (assisted by the infantry); the building of all mined dugouts and shelters of all descriptions; the construction of all strong points and emplacements, machine-gun posts, trench-mortar posts, artillery gun-pits, snipers' posts, O.P.'s, or artillery observation-posts, and so on; all demolition work, such as the firing of large charges of high explosives in mines under the enemy's positions, the destruction of enemy strong points, etc.; the building and maintenance of all roads; the construction and destruction of all bridges, construction and operation of light and heavy railroads, and many other duties too numerous to mention.

It is a work of alternate construction and destruction. The sapper must be a real soldier as well as an engineer. With the possible exception of some of the troops on lines of communication, and some railway, harbor, and other special units, they are all combatant troops, and are so rated and recognized. Many thousands of them are on constant trench work and other thousands on work close up, where they are continually shelled and exposed to fire.

The training of the majority of engineers includes the same methods of offense and defense as the infantry, and well it is that it does so. Almost every day on the western front they are called on to accompany the infantry "over the top," or on a raid on enemy trenches; to destroy enemy defenses; or to consolidate captured trenches; or again to "man the parapet" in holding off enemy attacks until infantry reinforcements can come through the usual "barrage." These things happen every day in the trenches, and the engineer soldier would be at a serious disadvantage if he had not been trained in the use of rifle, bomb, and bayonet. No one has a stronger admiration for the infantry than I have, and every one must take off his hat to these "pukka" (real) fighting men, but the fact remains that the sappers who have continual trench duty are subject to the same constant trench fire as the infantry are every day—the only real difference is that they seldom get a chance to "hit" back. They have their work to do, and seldom have a chance to return the compliment and "strafe the Hun," except in self-defense.

Strategists are pretty well agreed that the main successes of the war must be won by sheer hard trench fighting, and continued until the Germans will not be able to pay the cost in lives and munitions.

In this underground warfare the work of the engineers whose business it is to protect the infantry from enemy attacks below ground is both serious and interesting. At the headquarters of the mining regiment a note is opened from the Brigade Staff: "Enemy mining suspected at K 24 b 18—request immediate investigation." An experienced mining officer is at once detailed to proceed to the area in question and report on the situation.

At times it is a question of nerves on the part of some lonely sentry, but quite as often it develops that the enemy are mining in the immediate vicinity. Measures to commence counter-mining are at once started.

Then the game of wits below ground begins. Mine-shafts are sunk and small narrow galleries driven at a depth which the engineers hope will bring them underneath the German attack galleries. From day to day and even from hour to hour when they are within striking distance careful and constant listening below ground is undertaken, both friend and foe endeavoring to make progress as silently as possible.

In a regular mine system all manner of ruses are adopted to keep the enemy guessing as to the exact locality of each of their tunnels: false noises in distant or higher galleries; plain working of pick and shovel in others; meanwhile they are silently and speedily making progress in the genuine tunnels to the real objective.

Often we delay the laying of our charges of high explosive until we are within two or three feet of the enemy gallery and can even hear the enemy miners talking. On three occasions I have heard them talking very plainly, and listened for hours to them working on, quite unconscious of their danger. It was always a source of annoyance to me that I could understand so little German. At other times, and this has happened more than once in the clay soil of Flanders, we have broken into enemy galleries and fought them with automatic pistols, bombs, and portable charges of high explosives.

As a means of offensive warfare, mining has taken an important part, particularly in the launching of infantry attacks and night raids.

The battle of Messines Ridge in July, 1916, was started by firing at the "Zero" hour some 19 mines, spread over a front of several kilometres. In these 19 mines the aggregate of the total high explosive used and fired at the same instant was a few thousand short of 1,000,000 pounds. Some of the individual charges were nearly 100,000 pounds each, and had been laid ready for firing for over twelve months. Some idea of the frightful force and power of these charges may be obtained when it is remembered that each of the "Mills" bombs, or hand-grenades carried by British soldiers, contains one quarter of 1 pound, or 4 ounces, only of this explosive. As a result of this terrific blow the Germans retreated for over a half-mile on the entire front mined, and the initial objectives of the British were captured with astonishingly low casualties.

In counter-mining, when the enemy are met below ground in crossing under No Man's Land, it is the usual practice of the Allies to explode a charge or mine which they call a "camouflet." The camouflet totally destroys the enemy's gallery, but does not break the surface. The common and

the overcharged mine always blow a deep and wide cone-shaped crater. Large charges of explosive blow craters several hundred feet in diameter and well over 100 feet in depth.

In almost every sector of the western front in France where the trenches are close together, (that is, from 20 or 30 up to 200 yards apart), these mine-craters are found in No Man's Land. In sectors where mining has been very active, mine-craters are so common that they intersect each other. The "blowing" of a crater in No Man's Land at night and the immediate occupation and consolidation of it by the infantry and engineers is a wonderfully stirring affair. The strain on the morale of the infantry occupying sectors which are known to be mined is a terrible one, especially if they have no engineers to combat the stealthy attack. For the hundreds who are killed, buried, or injured from enemy mines there are thousands who suffer a mental strain from the mere suspicion of their existence.

Trench mining now, I am glad to add, is not the menace that it was in 1915 and 1916, but when the good-weather offensives cease and the usual winter trench warfare is renewed, mining will probably make its reappearance.

CHAPTER II

TO THE FRONT

B EING of British parentage and birth, most of my earlier life was spent in England. On coming of age, I left England for Canada, and after a few months there decided to study mining engineering in the United States. I attended a Western college, the Colorado School of Mines, leaving there in 1910 to practise my profession as a civil and mining engineer in California, where I took out my final papers as an American citizen several years before the war.

By reason of my birth my sympathies were naturally much aroused in the earlier part of the great struggle, and the fact that my brother had joined the Canadian forces directly after war had been declared, and the subsequent injury and death in battle of several British cousins, infantry officers, early in the war, preyed on my mind to such an extent that I left my home and practice in California in October, 1915, proceeded to New York, and from there to London. I applied for a commission in the Royal Engineers. No unnecessary questions were asked as to my nationality. I proved my engineering experience, and within two weeks was ordered to report to the officer commanding an officers' training-corps in London to commence training.

It may be of interest to note here that I was then in much the same frame of mind as many of our soldiers are now—generally afraid that the war would be over before they reached the trenches. I was first offered a commission in a field-engineering company of the Royal Engineers, but informed at the same time that it would be necessary for me to put in three or four months' preliminary training in England before I could get over to France.

This did not appeal to me. I was also of the opinion at the time that the war would probably be over before long; and later, by inquiry, elicited the fact that mining engineers were in immediate and great demand on account of very active enemy fighting underground in France. I found out later that a number of British mining engineers, coming back to England from India, Africa, and various parts of the globe to enlist in their country's cause, had applied to the War Office for commissions, and had been accepted at once, given three days to arrange their private affairs, obtain their uniforms and active service-kits, and report to the companies they were posted to in the front-line trenches. Certainly the red tape was cut here.

In less than three weeks I received my commission as second lieutenant, with orders to leave the O.T.C. and proceed to Chatham, to the R.E. Barracks, in company with several other mining officers, for a few days' further training preparatory to proceeding overseas. The British Government makes a grant of approximately \$250 to all officers when commissioned in order that they may supply themselves with uniforms and kit. These were soon obtained, and we were then instructed to hold ourselves in readiness to sail at any minute. We were first under orders to sail on Christmas morning, much to my disgust, as it was my first Christmas in England for many years, but we did not finally leave until New Year's eve, when we were taken by troop-train to Southampton, and embarked the same day.

On disembarking in Rouen we were all marched up to the various infantry and other camps established there some four or five kilometres out of the town. Together with several other engineer officers, I was assigned to an infantry camp for a few days' infantry training whilst awaiting orders to proceed up the line. Life in these camps is far from unpleasant, although the training is severe and exacting. The city of Rouen is an extremely interesting one, and numerous amusements were provided by the British and French authorities for the troops who are always coming and going from these base camps. As the scene of the martyrdom of the famous French saint Jeanne d'Arc, it is well known to all the world.

At the first officers' parade, at Rouen after I arrived in France, we were all informed by the camp adjutant that cameras were forbidden and that any man who had a camera in his possession after twenty-four hours would be court-martialled. I had one—a small vest-pocket-kodak—but after this order decided to send it back to a friend in England. Some six months later I was fortunate enough to secure a small kodak in one of the villages behind the lines and managed to get the few pictures which illustrate this account.

There are, necessarily, a large number of military-base and training camps established by the British in France, and the camps at Rouen seem to have been used mainly for reinforcement troops and returned casualties. I met one officer of infantry here who was returning to his regiment in a few days and who had just been reported "fit for duty" again after his third wound! Even early in 1916 this was not uncommon.

In the light of subsequent experience, I am more inclined to condole with the poor fellows who have borne the brunt of the struggle and escaped for long periods without being wounded.

Even the poor chaps who are fatally wounded seldom realize the fact at first, and are only conscious of sudden relief in the thought that they will be away from the trenches for a while. I have seen this instanced many times. In May, 1916, I was sharing a dugout with another officer

in the trenches near the Vimy Ridge. R.'s orderly, W., was returning with a message, and as he nearly reached the dugout he was caught by a heavy trench mortar and one of his legs blown off. He was also hit in several other places. We sent for "stretcher-bearers at the double," the usual call when casualties happen in the trenches, and R. promptly fixed him up as best he could with one of the field-bandages we always carried in our blouses. Poor W., one of the finest lads I have ever known, not realizing fully the fatal nature of his wounds, remarked cheerfully: "Blime, I ain't 'alf-crooked now for the rest of my days." We agreed with him, but pretended to envy his certainty of a "blighty." He was carried off to the nearest regimental aid-post, about a quarter of a mile down the nearest communication-trench, but the poor chap never left it, dying within a couple of hours.

At Rouen we received the usual training given to all combatant officers and men reporting there. This included daily lectures and practice in the following subjects: Bomb-throwing, machine-guns and their operation, infantry close and extended order drill, trench mortars and their use, gas lectures, etc., interspersed with long-route marches, sham fights and manœuvres, trench reliefs day and night, and practice and lectures on all the varied forms of frightfulness then indulged in by the opposing armies. The bomb-throwing was most fascinating. At that time the British were using eight or ten varieties of bombs, from the old handle-bombs with streamers attached, to the cricket-ball bomb, which one had to light from a brassard on the arm. I had never even seen a bomb before, and always associated them with the playful humor of the now back-number anarchist. Without any preliminary practice, we were detailed to throw these "live" bombs. My heart was in my mouth as we approached the bombing-trenches, but I very carefully watched the operations of the other fellows, and listened attentively to the very matter-of-fact and callous British corporal instructors. My nerves, however, were in fair shape, and I threw every type without any disastrous consequences, though my heart was certainly working overtime.

While writing of bombs, I want to sound a note of warning to those of our boys who will have this form of amusement in store for them. In these days the throwing of "dummy" bombs always precedes the training with live ones, and this is wise and natural, careful habits being formed in this way which eliminate largely the fatal accidents which have happened so often in the early training of British and French units. The one essential is calmness. Nearly all troops who are highly disciplined have this calmness bred into them, and very useful and necessary it is for almost any operation in modern warfare. A "jumpy" soldier, or one whose nerves are not in the best of shape, very frequently knocks his arm against the parapet whilst throwing a bomb, drops it in the trench, fails to throw it clear of the parapet ahead, and in other ways not only seriously endangers his own life but those of his comrades practising with him.

The training at these base camps is made as realistic as possible, one feature being the passage through "gassed" galleries or chambers of all officers and men who report at the camps. The chambers are filled with the strongest and deadliest of gases, chlorine, phosgene, bromine, and other gases being used in more concentrated form than one encounters in the regular attacks. All this and other training gives men the confidence necessary to face bravely the fighting ahead of them.

After six days at Rouen I was posted to my company, and ordered to "go up the line."

Our billet, it developed, was in the village of Saily-sur-la-Lys, two miles from the front-line trenches opposite Fromelles, and a little south of Armentières, incidentally the scene of very heavy fighting in 1914 and recent operations.

I was fortunate enough to get for a billet a small room off the kitchen of a Flemish farm-house in the village. Our mess, a rough wooden hut, was just across the street, and after proceeding there to meet my company officers, we had a very excellent dinner of a couple of chickens obtained in some mysterious way by our mess corporal. During dinner I was more or less entertained with stories of that day's events as related by the other men, one man describing how a German sniper had put a bullet through his cap during the afternoon in the trenches. (It was not until six months after this that we were supplied with steel helmets.) Another man told how an aerial bomb dropped from an enemy plane had landed within a few yards of him on a road several miles back. I thought the object was to string newcomers like R. and myself, but found out later that it was all part of the usual days' programme.

The next morning my section commander suggested that I ride up with him to inspect our work in the front line. It was taken for granted that I could ride an English motorcycle, and although I was familiar enough with our American varieties, I surely had my troubles with this one. The slipperiness of the metallated and paved roads in this part of Flanders increased my uneasiness. I broke down several times on a very unhealthy road, shelled with annoying regularity by the Boches, much to the disgust of Captain P., who, however, good-naturedly helped me out on each occasion. We all had our troubles in riding motorcycles on the roads in Flanders and France, especially on the pavé or granite-block paving which is so common. When it's wet, and that means most of the time, about the only way to prevent skidding is to open your throttle for all it's worth and travel as fast as you can. One morning, during my first week, I had some six, more or less, painful falls within a mile in riding up. After the last one, I was so mad that I flung the remains of the machine into the ditch on the side of the road and proceeded to walk the rest of the way up. In a short time, though, we got the hang of the machine and could ride anywhere day or night. As a matter of fact, we never lingered on the roads going in and out of the trenches. Most of the metallated or flint roads of Flanders had a ditch on either side, into which we took occasional headers. One had to ride carefully and fast. A motorcycle with the throttle wide open

helps to drown the noise of enemy shells bursting in one's vicinity.

Many wild rides I remember, especially at night when, of course, no lights could be used within three or four miles of the front line; and candor compels me to confess that occasionally we would take an extra "whiskey and soda"—the standard British drink—at the mess before leaving in order to give us a little extra Dutch courage. It was always effective; we didn't care much what shell-holes we hit, or how many mud-baths we obtained. To resume, after much trouble Captain P. and I arrived at the advanced material billet, which is always situated within a few hundred yards of the entrance to the communication-trenches, and, leaving our machines here, we started up the trench.

This sector of the trenches, opposite Fromelles, at that time would have been described by veterans in trench fighting as a quiet sector, but I cannot say that it appeared particularly quiet to me that day.

My first impressions under fire were quite complex, but I distinctly recall the fact that I was more scared by the firing of our own artillery than by the comparatively few shells of the enemy which burst in our vicinity. So many things were happening around me in which I was so intensely interested that my curiosity got somewhat the better of my fears, and only when bullets whistled very close, or shells burst fairly near, was I much worried. My second day in the trenches was quite different. I had started to come out alone a few minutes before "stand to," or "stand to arms," as it is officially termed, that is, just before dusk; and as I was making for the communication-trench to go out I was nearly scared out of my wits by a "strafe" which started as a preliminary to a raid which occurred a few minutes later. This raid was not on my immediate front, but about a quarter of a mile farther south, opposite Laventie, and was staged by the Irish Guards. The abrupt change from more or less intermittent fire between the trenches to a violent and constant bombardment from every machine-gun, trench-mortar, rifle-grenade, and other weapon in the trenches, joined at the same time by the howitzers and guns from one to three miles back of the lines, combined to make me feel as though "hell had broken loose," and I made for the nearest dugout with as much assumption of dignity and speed as any near-soldier could effectively combine. It was only then that I fully realized that there was a war on.

I have been in numerous bombardments of this nature preceding night raids since that time, and they are always peculiarly violent, but I never recall any occasion on which I was more badly scared. It was rather curious, too, because nearly all the fire was from our own trenches at first, and the German retaliation did not come until some time after; but all our trench-mortars and other shells from the back just skimmed our parapets so closely that they certainly "put the wind up" me in more senses than one. One's first raid, anyhow, is calculated to be more exciting than a pink tea-party. "Put the wind up" is a term which requires some explanation. The Tommies use it on every occasion when a man shows fear; they say he is "windy" or "has the wind up," until now it is an essential part of the trench language.

Enemy rifle and machine-gun fire was very heavy and we had our share of casualties in this way. One of our advanced billets, Two Tree Farm, was an unhealthy spot. The Boche had several rifles trained on the entrance to this old ruin and the bullets whistled by about shoulder-high regularly through the night across this spot. It was not a favorite place for nightly gossip. We had built a wooden track from near here right up to the front line and would each night tram up our timber and supplies on this light track. We had plenty of grief when our trolleys would slip off the rails and into a foot or two of mud alongside. At one of these times I was going up with supplies and the enemy were getting us taped nicely with their machine-gun fire. Several attached infantrymen were working with us. One lad who was working particularly hard came around to the back to give us an extra hand in getting the car on the track again, and dropped quietly into the mud without a sound with a bullet through his head. We used to figure on two or three casualties a night on this tram. On going in or out we had to walk from Two Tree Farm over a stretch of level ground about a quarter of a mile before we entered V.C. Avenue, the communication-trench. This was not a pleasant walk on account of the absence of cover and the rain of machine-gun and rifle fire which swept this area.

CHAPTER III

UNDERGROUND

THE trenches in Flanders consist, in the front line at least, of sand-bag breastworks, and are not regular trenches at all. The country is so flat that it would be impossible to drain properly a series of trenches cut in the original soil. As a result of the lack of drainage, the consequent difficulties and hardships can be well understood. Each night the enemy would tear big holes in our breastworks in the front line, and we would have to duck and run past them on the following day, and at night repair them again, under their machine-gun fire. The fact that their snipers and machine-gunners had the gap well taped in the daytime didn't add to our pleasure in repairing them at night.

The trenches on our company front here, which included underground galleries emanating from about 16 different shafts, or mine-heads, on about a half-mile front, averaged from 70 to 120 yards distance from the enemy. As the water-level was about 25 feet, the underground tunnels were shallow, mostly about 20 feet in depth. Many of our mines would be entirely flooded out, and it was only by constant and energetic work on the hand-pumps that we kept the water down in the existing galleries. It was a common thing for us to have to wade in rubber hip-boots through tunnels with over a foot of water in them. We worked in these mines twenty-four hours of the day, Sundays and holidays—in fact, no one knew when a Sunday came around, every day being the same in the trenches. Every officer and non-commissioned officer knows the date, however, as numerous and elaborate progress and other reports were furnished to the staff daily. The "padres," or chaplains, sometimes reminded us of the fact that Sundays do occur when we were out in billets back of the line. We worked usually three shifts of eight hours each, and all of our timber and tools, the latter of the most primitive kind, rendered necessary under the unusual circumstances, were brought up at night by company trucks to our advanced billets, which were situated about a mile behind the front line, and close to the entrance of communication-trenches.

The enemy had started his underground mining operations several months before they were discovered by the British and had caused many casualties in the ranks of the infantry; in fact this was the case everywhere on the western front, both in the British and French lines. The Hun has a text-book rule which enjoins him to start underground operations from any trenches which are not farther than 100 metres from the enemy, and in many cases where the distance exceeded this, or where he wished to specially defend any observation-posts, machine-gun posts, or strong points of tactical advantage, he would commence mining from trenches still farther distant.

Handicapped as were the British and French from this cause, they have succeeded by energetic and daring work since that time in more than outmatching the enemy below ground, until now mining beneath the trenches no longer consists, as it did then, in almost exclusively defensive operations. Of its use as an offensive measure, the launching of the attack in the battle of Messines last year serves as an excellent illustration.

In our part of the line at Fromelles, however, at that time the Germans had succeeded in exploding many mines with disastrous effect under our trenches, with the resulting loss of life of many infantrymen and some engineers, and in our early operations they gave us much cause for concern. They "blew," that is, exploded mines, under several of our shaft-houses or mine-shafts whilst the latter were under construction, and destroyed several of our galleries before we could get within striking distance of them. When I joined the company, many of our shafts had been constructed and a considerable footage of galleries completed. In this work below ground in clay it was necessary, of course, to be as quiet as possible so that the Germans could not locate our exact position. Of the fact that we were engaged in counter-mining, and that they were mining also, every one on both sides of No Man's Land was aware, but the point was to keep the Hun guessing as to our exact whereabouts while we discovered all we could about his. Many devices were employed both by the enemy and ourselves to try and fool the other. Our lives and the lives of the men on top depended on our success in outwitting them. Silence below ground was absolutely essential, and every possible precaution to secure this was rigorously insisted on. When we approached, as we often did, in these clay galleries, to within three or four feet, before firing our mines, the men underground would work without boots, often without lights; blankets would be hung at different places along the galleries to drown noise; the floors of the tunnels covered with sand-bags; all timbering done by wedging, no nails being allowed in construction, screws being used instead, and any and every other device thought of to prevent noise adopted.

On many occasions, and particularly when engaged in loading a mine-charge (work always done by the officers), connecting up the detonators or electric leads necessary, etc., when within a few feet of the enemy, and when at the same time we could hear them plainly at work, and were convinced they were employed, by the sound, on the same errand as ourselves; namely, laying a charge of high explosives with which to blow us to eternity, some crazy sapper would fail to stifle a cough or subdue some throat trouble. We always felt inclined to brain these chaps with anything handy, although, poor fellows, they were doing their best to be quiet. Luck certainly was with us on these occasions, and not in one instance in our work in Flanders did the Germans

succeed in blowing us when we had more than one or two men underground at the time. How we escaped I don't know. I am sure it was only by the exercise of great care and good judgment, a lot of luck and a kind Providence. Farther south in the chalk country of France everybody below was killed by the resulting concussion, or poisonous gas, which developed on several occasions when the enemy caught us.

The "jumpiness" which all new troops are subject to at first had its influence on us, as on the troops above ground; and in the month or two previous to my joining the company sometimes a mine had been fired when probably by delaying it a little longer we might have secured more satisfactory results in damage and casualties to the enemy. That condition, however, wore off and we very seldom blew any mine unless we had the most certain evidence that we could get a good toll of Germans. We would frequently hold our mines for several days or a week or two, and when the listeners reported that the enemy could be heard in sufficient number in their tunnels just near our charges, we would connect our double set of electric leads to dynamo exploders or blasting-machines, push the handles home hard, and lift them to a higher sphere of operations.

Our galleries in the clay were for the most part from four and a half to five feet in height and from thirty inches to three feet in width, with numerous listening-tunnels, or "rabbit-holes," in size three feet by two, leading off them as we approached the enemy lines.

It was our practice to build a rough mine-chamber or shelter, constructed of walls of sand-bags filled with clay with a few corner-posts of wood, and to cover this shelter with a sheet or two of corrugated iron and sometimes a layer of sand-bags.

These chambers were built usually at from ten to twenty feet back of the sand-bag breastworks which formed our only protection from enemy fire. From these so-called mine-chambers we sank vertical telescope-shafts, sometimes using case-timbers, and sometimes collar-sets with logging or spiling driven in behind. In Flanders, where only these surface shelters can be built, we would usually construct a dugout alongside or connected with a mine-chamber. In the trenches farther south we used the deep dugouts, twenty or thirty feet deep, and often started our systems of tunnels or galleries from them.

Much difficulty was experienced in sinking these shafts. On account of the shallow water, level pumps were resorted to at once, often two or three being necessary to keep the water down. With constant pumping and digging we attained depths of from twenty to twenty-five feet below the surface. At the bottom of the shaft we put in sumps from which to pump the water, and then proceeded to drive our galleries ahead. For the smaller tunnels we used two-inch case-timbers or small timber-sets and excavated the clay with small, specially constructed shovels which we called "grafting-tools."

The man in the face would lie with his back across a plank stretcher placed across the nearest timber set, and would work the grafting-tool with his heel, whilst a second man would very carefully shovel the dirt into sand-bags, and pass them when filled to the man behind him. The latter would in turn pass the sand-bags along to other men as far as the foot of the shaft, when the bags would be attached to a rope and hauled to the surface by means of a rough prospector's windlass.

As the work progressed we would often screw wooden rails to the floors of galleries, and then use small rubber-tired trolleys or cars to move our sand-bags from the face.

During the cold, damp winter of 1915-1916 we could always get warmed up by going below. In the chalk-mines in the succeeding summer it was also quite pleasant to go below and cool off. The men working underground were certainly lucky in this respect. Down below, the rumble of the shelling overhead could be very distinctly heard, and it interfered much with our effective listening to enemy mining operations. It was a great relief sometimes though to get away from the ear-splitting Kr-r-r-umps all around.

In the "rabbit-holes" we were, of course, obliged to crawl on our hands and knees, and would spend many long hours listening to enemy work, which we heard close to us in these "rabbit-holes" most of the time.

Despite all attempts, it was impossible to keep these holes dry. I can remember several occasions when I was so thoroughly dead beat and "all in" that for a few minutes I dozed or slept whilst listening, incidentally lying in several inches of water, and only a few feet from the enemy's work. It was necessary for us to have experienced "listeners" to keep in touch at all times with the progress of enemy work whilst our own was going on, and naturally the officers on duty had to do a large part of this to satisfy themselves. Regular reports were kept in the dugouts on the surface as to the enemy's activity in every direction, and these were carefully studied and plotted on maps by all subalterns when relieving. Our dugouts, as they were called, although they differed very much from the more or less elaborate dugouts which we now use farther south in France, were really only splinter-proof shelters, and consisted of walls of sand-bags with a sheet of corrugated iron on top, and one or two rows of sand-bags on that. A direct hit of any kind was fatal to all occupants. Many hours have I spent in those dugouts with trench mortars and shells dropping all around, and wondering whether their next mortar was going to crack our "egg-shell" of a shelter. However, when things got too hot, we had a big advantage over the infantry in the fact that we could suddenly recollect at these times some very important work twenty feet below ground in our mines which demanded our immediate attention. Like the infantry, though, we were of a rather fatalistic turn of mind, and usually trusted to our luck. One of the half-dozen men

who came over to the trenches from England with me was unfortunate enough to be caught in a dugout of this description the very first time he entered the trenches, a mile or two down the line from us, when a "rum-jar" landed on it. Another officer with him at the time was killed, and several men also, but he got off with a bad head wound which sent him back to an English hospital for a few months. Near us was an infantry company headquarters' dugout and we would go there for a little change from time to time. When fate was kind to us we would share some very decent meals together, usually the contents of some one's parcels from England.

These meals were not served in "Palais Royal" style, and often fingers were employed in lieu of forks, but nevertheless we had some merry times. Humor and tragedy touch elbows in the trenches. A man is laughing one minute—the next he is lying dead with a bullet crashed through his heart or brain; or what is more usual and worse to the survivors, with his body so mutilated that it is difficult to find enough of his pitiful remains to bury. So it was with us. We would wear that anxious look occasionally when Fritz would lob over some form of frightfulness which landed very close to us; but it seldom disturbed us for long. One night I had accepted an invitation to dinner with some friends of a very famous old British regiment, the Rifle Brigade, who were garrisoning the trenches we were in. The company commander was a young man about twenty-three, one of the very finest types of the old British regular army officer, and we had been very good friends. Friendships are made quickly under such circumstances. We had "blown" a mine the previous evening, and it was the duty of the infantry here to wire the crater formed by the explosion. The mine had been blown as a defensive measure in preventing the wily Hun from coming closer to this point underground and was located about midway between the trenches in No Man's Land. While we were at dinner, a runner reported that one of Captain G.'s corporals had been wounded while finishing some work on the wire.

Notwithstanding the fact that even at this time orders were in effect that no infantry company commander should go into No Man's Land unless in emergency or on a regular attack, my gallant friend, Captain G., at once got up from dinner and said he was going out to bring his corporal in. We endeavored to dissuade him, and suggested the usual course of sending out the company's stretcher-bearers to get the man in. He would not listen, but hurried out. Climbing over the slimy parapet he attempted to reach the wounded corporal, but was shot through the head just as he reached the edge of the crater. Two stretcher-bearers at once went out and were also shot in a minute or two. Two of his subalterns then very cautiously proceeded to go out through one of the cunningly devised "sally ports" which issue at frequent intervals from the breastworks out to No Man's Land, recovered the bodies, and brought in the wounded corporal. The loss of this fine officer made a great impression on me at the time, but so many incidents of a similar nature were constantly happening that one becomes callous in time without sensing it. I only know that if one gave way to his feelings his nerves would shortly break, and his usefulness would be ended—a somewhat brutal philosophy, but necessary in a war such as this that the German fiends have forced upon us.

By night we would get rid of our spoil or clay from the underground workings, dumping them from sand-bags or gunny sacks into shell-holes, mine-craters, abandoned trenches, depressions in the ground, behind hedges, and in other places offering some concealment from enemy observation. This work was all done under the enemy's machine-gun and rifle fire. Both we and the Boche would fire the "Very" or star lights at more or less regular intervals during the night; the enemy much more frequently than we; and the parties or individuals working on top would have to be very careful when they happened to come within the range of these ghostly silver flares. Usually it was sufficient if one kept quite still, but where trenches are very close and the light drops behind you and throws your figure into relief, the wise course is to immediately drop flat and remain motionless. It isn't quite so easy as one might imagine to stand still on these occasions; but it is quite effective. Any movement of a soldier is spotted in an instant, and at once every sniper and machine-gun operator, constantly on the alert on the enemy parapet, opens fire. One night I was working with my men on top in this way disposing of our sand-bags, and I noticed an infantry officer with a party of four men placing sand-bags on top of a dugout near us. An enemy "Very" light flashed over and behind us, throwing all of our figures into relief. We dropped pronto, as did the men with the infantry officer, but he, poor chap, then only three days in the trenches, was too slow, and got a bullet square through his head. It is strange to note the confidence with which men will work on top of the trenches at night after a little experience. At first it seems impossible that the enemy machine-guns can miss you in their frequent and thorough traverse or sweeps of the lines opposite them, but you gradually gain confidence and find that, unless you expose yourself carelessly by moving when their lights go up in your neighborhood, you usually get off scot-free.

There are many complaints of the monotony of trench life, and certainly some of them are well founded, but in our work there was not much room for monotony.

During my first month or two I was intensely interested in every weapon that the British were using, and whenever a machine-gun, trench-mortar, grenade, or sniper officer was about to start a "shoot" in my sector, I was invariably invited to witness the affair and learned to operate them all in time, much to my satisfaction. My particular delight consisted in using a Vickers machine-gun at night in traversing up and down the enemy's communication-trenches. I guess we soon acquire bloodthirstiness; at any rate, one develops without conscious effort an instinct to "strafe the Hun," not only on general principles, but particularly to avenge the loss of comrades. The artillerymen share this feeling; the F.O.O., or forward observing officers, for each artillery battery, can be found prowling around the trenches at all times, searching the enemy's lines with

their powerful field-glasses for targets, and continually discussing the possibilities of new ones with the infantry and engineers in the lines; and at nearly all times lamenting the fact that they can get nothing to shoot at.

While we were here they sent us a bantam division to relieve the old division. These little fellows, hardly a man of them being over five feet two inches in height, were certainly not short of pluck. Nearly all of their officers by way of contrast were exceptionally big men, all over six feet. It was very amusing to see the bantams climbing on to their fire-steps and building up sand-bags to step on so they could see well over the parapet. It's a useful thing, anyway, to be short in trench warfare. You don't have to duck so much.

CHAPTER IV

CRATER FIGHTING

As it was a rare day for us in Flanders when the enemy or ourselves did not "blow" a mine, we were always on our toes. Except in cases of sudden emergency we informed the infantry of our intention to fire a mine, and gave them the time necessary to withdraw their men to points of safety. Often we would blow a mine at night in cooperation with the infantry so that they might at once rush out and "consolidate" the crater, or the nearest lip or rim of the crater. Certain positions in No Man's Land were particularly desirable on account of their strategic value; sometimes for the purpose of enfilading the enemy's trenches by occupying one rim of the crater; or perhaps for the obtaining of better observation-points, or for any other reason. The consolidation of these craters is a wonderfully stirring business. A little explanation of a crater might help.

The engineers fire large charges of high explosives from underground galleries, at a depth of anything from 20 to 200 feet, with the result that a huge hole is blown in the ground in the shape of an inverted cone, like the average shell-hole, but very much wider and deeper. No Man's Land in front of us, where the trenches are close, is pitted with great numbers of these craters, some blown by the Germans and some by us. The craters vary from the small ones, about 70 or 80 feet in diameter and 12 to 20 feet deep, to larger ones to such dimensions as 300 feet in diameter and up to 120 or 130 feet deep. The size, of course, depends on the charge of high explosives used, the depth of the mine-galleries, and the soil one springs the mine in.

The enemy is usually just as concerned with the consolidation of the rim or lip of the crater on their side as we are with ours, and a battle royal for their occupation results. Machine-guns on both sides concentrate fire on the crater almost before the debris from the explosion have had time to fall. It is a weird and wonderful sight. From a fairly calm night, usually with only desultory fire going on, the thunderclap comes. Before firing, which is usually done electrically, the engineers calculate the exact diameter of the crater to be formed, and the previous night the infantry or engineers will have completed a trench forward from the front-line or "jumping-off" trench, to an intersection with the rim of the proposed crater. Directly the charge has been fired, they rush out through this trench and hastily throw up breastworks on the lip of the crater formed. The machine-gunners take up proper offensive and defensive positions; the bombers, usually at the head and the flank of the "throw-up," or lip, erect the wire screens necessary for their temporary protection; the "wire" men place their barbed wire around the portion to be consolidated; and all ranks dig themselves in as fast as they can, later bringing up such timber or other material as they can to strengthen the positions. When it is planned to hold the whole of the crater, the "wire" men completely encircle it with entanglements, and the Lewis gunners and bombers make such changes in disposition as are necessary. This represents the usual procedure when a crater is blown in No Man's Land. Thousands of these craters are so exploded.

On numerous other occasions, when we have penetrated below the surface with our underground galleries under and across No Man's Land to below the Germans' front-line trenches (and in many cases we go as far as their support lines without being discovered), our little affairs are accompanied by infantry raids. Pandemonium reigns supreme at these times, and nothing can be likened to the noise and apparent confusion in which these usually very successful raids are conducted. We fire our mines under their trenches and the infantry raiding-parties immediately cross and clean up any Germans we might have missed with our attentions. As a result of our noiseless work below in the clay, we would occasionally break through into each other's galleries.

Perhaps you would be interested in an underground fight which we had with the Boche in one of our galleries twenty feet below the surface under these trenches. Some two weeks before this we had successfully blown a mine, and two days later had discovered and worked through the broken German gallery we had destroyed. Passing through this gallery, we continued our silent work in the clay, and about fifty feet farther turned off to the left in order to strike what we thought would be the enemy's main defensive gallery. Our miners who were working at this face hurriedly sent up word one morning to our dugout on top, just off the shaft-house, that they had broken into the German gallery with a small hole in the clay. All men working underground had standing orders that if this occurred at any time they should at once put out their candles, observe strict silence, plug up the hole with clay, and report forthwith to the officer on duty. Warning all men to leave the near-by workings below, the officer on duty hurried down to the spot, stopped long enough in our main gallery to make up a mobile, or portable, charge of thirty pounds of guncotton from our magazine, which we had established there for just such emergencies, then proceeded with the utmost care to the gallery mentioned. Lieutenant G. had connected up a dry guncotton primer to the charge, inserted a detonator attached to a short piece of safety-fuse, which latter would burn for about two minutes before detonating the charge. The men had noticed and heard three, certainly, and probably more, Germans at work in their gallery, which was lighted with electric light. Lieutenant G., accompanied by another officer, very carefully withdrew the clay plug, enlarged the hole, slid the box containing the charge into the enemy gallery, lit the fuse, and swiftly and quietly withdrew from the scene. He reached safely

the main gallery, quite a distance from the charge, in time to hear the explosion. He then climbed quickly to the top to escape the resulting fatal gases developed by the detonation of the high explosives.

I arrived on the scene a few minutes later and my section commander asked me if I was "game enough," as he described it, to go below with a sapper to investigate the damage done and see how many Germans we had accounted for. I was very willing; so Doherty, the sapper mentioned, and myself equipped ourselves with the "Proto" oxygen breathing-apparatus necessary in going into "gassy" galleries, then descended, carrying also the usual canary in a cage to test the air. The canary soon toppled off his perch and fell dead to the floor of his cage. Canaries and white mice are used in large numbers to detect the presence of poisonous gases below, and, being very susceptible to bad air, are soon killed. [It is a curious sight to see these canaries hung up outside dugouts in all trenches where mining operations are conducted.] Both Doherty and I had previously been trained in the use of the oxygen apparatus, and were quite confident of its ability to take care of the carbon monoxide so that it would not affect our lungs. Before we reached the enemy gallery, I stopped long enough to pick up and carry with me the air-hose, and this I left later in the enemy's workings so that our men on top could pump good air in and allow others down in a short time to resume the offensive. We reached the gallery, found the remains of three Boches that "G." had "sent west" with his charge of guncotton, then proceeded to investigate the damage done. As the enemy gallery was very closely timbered, we had only broken down a portion of it with the charge employed. On entering their gallery, I had carefully searched for and cut all wires that I found there. This was a regular practice with us, the object being to sever all electric leads, wires, or fuses which the enemy may have left connected to a charge or mine already laid.



Breathing-apparatus necessary in going into "gassy" galleries.

On breaking into any of these galleries the officer in charge usually enlarges the holes in the clay until he can put his arm through; feels around until he finds any wires, and promptly cuts them with his pliers. Such operations of necessity must be done in darkness and without sound, and one's heart is working like a pump-handle. I was agreeably surprised to find that no Germans had summoned courage enough to investigate matters as we were doing; Doherty, however, did not share my sentiments, and gave me the impression as best he could, enveloped in the oxygen apparatus as he was, that he distinctly regretted their lack of sand. We were both armed with electric-torches and revolvers, but we were not keen on using them oftener than necessary, and so advertising our presence. After leaving the air-hose and noting results, I picked up the cap of one of the defunct Germans, and we came out, or rather crawled out. Our progress was mostly in the form of a crawl, and the steel oxygen cylinders knocking against the timber sets in the narrow galleries as we proceeded did not improve our tempers.

We arrived safely back to the surface and I made my report. After pumping air into the gallery for about an hour, we all went below again, and my section commander and Lieutenant G. crawled through to examine conditions in the enemy's gallery, while I was engaged in the magazine in opening boxes of guncotton and getting more primers and detonators ready for action. Captain B., the section commander, came back presently and informed me that he and G. had been slightly gassed during their investigation of the enemy tunnel, but had not met any Boche; he had decided on making up some raiding-parties, would arm them with mobile charges; attempt to

explore the German gallery and mine system, and, if possible, try and destroy their shaft. The difficulties of proceeding farther into the German galleries, now that the enemy was thoroughly aroused, were pretty large, but we agreed with him that it was up to us to get them somehow if we had a possible chance. We made up three of these parties at once; each composed of one officer, one non-commissioned officer, and two sappers; each party armed with revolvers and a mobile charge of thirty pounds of guncotton, the latter being carried in boxes. Each of the sappers provided himself with a couple of Mills bombs, their confidence in these useful little articles on all occasions being quite touching.

It was arranged that Captain B. should station himself at the junction of our gallery with that of the Boche, and if our plans looked like coming "unstuck" he would blow his whistle hard. On this signal we would all hustle back to our own galleries and shaft-head as quickly as possible. "The plans of mice and men gang aft agley" and our luck was not good on this stunt. The other two officers were senior to me and, as usual in such circumstances, resolutely insisted on their right to take their parties in first. It was rather an exceptional affair, our breaking into an enemy gallery, as in most cases either the enemy or ourselves would have fired their mines when within striking distance of each other, so all the men were very keen on it. In my own case, I was so keyed up with excitement that I entirely forgot a bad toothache that I had—resulting from an abscess under a large molar—and these things are usually pretty difficult to forget, even in the trenches. Well, the first two parties passed quietly into the enemy's gallery; and just as I was about to lead my own party in, Captain B. blew his signal whistle, and, according to instructions, I took myself and party back to our own shaft-head, followed soon by the men of the other parties; last of all by the other two officers, who had entered the enemy gallery first. Our plan had come "unstuck." It developed that the first two parties had managed to get in a short distance before meeting any opposition, but that the Boches had then opened fire on them, and they had stopped just long enough to return a few revolver shots, set light to the fuses on their two mobile charges, and run for it. Altogether this last attempt had not been very successful, though we fortunately had no casualties.

I was again asked to go below with Doherty in breathing-apparatus and see what effect the firing of these two last charges had made on the gallery. We did so, but found no living Germans prowling round in the tunnel. We left the air-hose this time farther up their more or less destroyed workings, and reported that, after pumping, we could get down soon again to resume operations. For the time we posted six sappers and a non-commissioned officer near the enemy's entrance to cover any endeavor on the part of the latter to get through into our galleries. They did not attempt to do so; in fact, they didn't seem to care much about going near the place—which fact perhaps proved fortunate for D. and myself, though I knew that fine little Irishman was aching for a scrap with them.

In an hour or so, when the poisonous gas had again been blown out and fresh air pumped in, Lieutenant G. and I, being rather concerned over the possibility of the enemy trying to pump in gas on our men below ground, decided to go in on our own initiative and see what we could do. We proceeded below, armed each with revolver and torch, and were followed by another officer, Lieutenant B., carrying a mobile charge, and a sapper with a second. We walked and crawled very quietly and cautiously until we reached a point about 150 feet up the enemy gallery; here I suggested to G. that it would be decidedly unwise to try to get any farther; the electric lights still alight in the gallery were just a few feet ahead of us, and we could distinguish the sounds of whispering and stealthy walking very near. In crawling in we had, of course, used our torches as little as possible. If I had not persuaded G. as to the wisdom of my advice, I believe he would have attempted to go right up to the German shaft-head. I walked back a little way along the gallery, signalled Lieutenant B. and the sapper to hand me the guncotton charges; then instructed them to clear out.

We decided to fire the charges at this point; so after collecting, with great care to avoid noise, a number of sand-bags filled with clay which the Germans had left in this gallery, we used these for tamping the charge and G. lit the fuse while I covered the gallery with my revolver. G. said "hold on a minute while I get a souvenir," and promptly grabbed a five-foot length of three-inch air-pipe which the Germans used in their work, while I picked up a few empty multicolored sand-bags of the kind favored by the Boche miner.

The shortness of our safety-fuse was also a strong factor in preventing us from going farther. It would burn about two minutes, and in these two minutes we had to crawl and squirm through some very awkward sections in the galleries. In two places there was only room enough for our bodies to scrape through. The timber and clay had been destroyed in several places, and it was difficult at these spots to get through without bringing in some more timber sets or invite clay falls which would have imprisoned us with the charge. Death as the result of an overdose of carbon monoxide is not so bad, as one just drops into a gentle and insidious sleep from which you fail to wake; but the concussion resulting from the detonation of the charge is not such a pleasant affair. We fortunately reached a spot of comparative safety just in time to hear the detonation of the charges. Afterward we climbed to the surface.

I went below again after a half-hour had elapsed; this time without the oxygen apparatus, as I was physically too weak to carry its forty pounds again. Another sapper went down with me, wearing the Proto apparatus, and I leading with a rope around me in case I should be gassed and have to be pulled out. The lad who came with me was not of the same stuff as D.; once, whilst I was crawling ahead of him, I knelt on a piece of broken timber; it made a sharp noise, much like the crack of a revolver, and this rather disconcerted him. He soon recovered, however. No

Germans were in evidence. If there were any in their tunnels they were mighty quiet.

This was a busy day for me. I must have had that "rabbit's foot" around my neck in going down first after the charges three times and coming out with a whole skin. We could not quite reach the advanced spot where we had fired the gallery; although near enough. I was gassed a little on this trip. Some two hours later, having prepared a large charge of guncotton, we went below and laid it. During the process, the enemy, gathering their courage, had come back to their gallery and, having cleared some of the débris away, fired a number of shots at our fellows whilst they were loading. We fired the mine in the usual way, by means of blasting machine from our dugout. This dugout was built with an entrance leading off to the mine shaft. We thought our troubles were over for a while anyhow, and four of our men carelessly remained in the dugout, talking and smoking for some ten minutes or so after firing. One of them happened to look up around the dugout, and noticed that all the canaries which we kept there at night, in some four cages, had toppled from their perches and were lying with their feet sticking in the air. With one bound they reached the dugout entrance and fresh air, realizing that the poisonous gas must have come up the shaft before penetrating to the dugout. Poor Captain B. was rather badly gassed and was carried away on a stretcher. He recovered, however, after a few days at the nearest C.C.S. Am glad to record that Lieutenant G. received the Military Cross for his share in these operations, and Captain B. the D.S.O.

On many occasions the British Tunnelling Companies have outwitted the cunning Hun. Here is one instance. The British miners broke into an enemy's gallery in clay and struck the tamping of a charge they had laid and were holding ready to fire. This tamping consisted of clay bags built up in galleries back of the charge in order to confine and intensify the explosion. Working through the tamping, the sappers reached a mine charge of about 4,000 pounds of westphalite, one of the various German high explosives. Carefully extracting this, they connected up the enemy's leads to one of their blasting caps to insure non-detection for electric continuity, and then withdrew. What the Hun mining officer said and felt, when he attempted to fire his mine, may be left to the imagination.

CHAPTER V

TUNNELLING IN THE VIMY RIDGE TRENCHES

IN April, 1916, we were relieved of our work in Flanders, and ordered to move down to trenches some thirty miles farther south, to the chalk country of Artois. The new trenches were near Neuville-St.-Vaast, and about a half-mile south of the famous Vimy Ridge. The British at that time had just taken over another portion of the French line extending down as far as Péronne, in the Somme district and the infantry holding our part of the line at Neuville-St.-Vaast had relieved the French infantry only a few weeks previously. We were to relieve the French Territorial sappers. Mighty glad they must have been to hand this troublesome sector over to us, but no evidence of this was to be seen in their characteristic casual and matter-of-fact attitude. We moved down in the usual way. The A.S.C. (Army Service Corps) furnished us with thirteen buses to take our men down, while the officers rode down in advance on motorcycles. I was detailed to take charge of the convoy of buses, and accompanied them on a motorcycle. Our fellows were all in high spirits at the prospects of a change, and the stops were many. The natural consequence was that I had my troubles in keeping the men from patronizing too liberally the many inviting estaminets on the road down.

After having spent several months in so-called rest-billets pretty close to the line and shelled regularly, we were all immensely pleased to find that our new rest-camp was to be situated in a very pretty little village named Berles, near Aubigny, and some eight miles from the firing-line. This camp, of course, was only intended as a rest-camp, and billets for only a quarter to a third of the company were necessary, as this represented the number of men who would be on rest at any one time. We soon made acquaintance with our advance billets, and these were close enough, being only a mile behind. Captain M. had preceded us to Berles as the billeting officer. The officer who talks French best is usually the man for this job, and he always does very well for himself when it comes to picking his own billet, having first choice. Incidentally it may be remarked the man who talks French well always has the edge on the other fellows. The usual old-fashioned and picturesque farm-house furnished us with a room for a mess. We looked out from this mess-room on to the inevitable midden which is a feature of all the French farm-houses in this part of the world. The buildings of these farms are always arranged in the form of a square, with the house on one side, and barns, stables, and granaries on the other three sides all enclosing a yard in the middle of which is invariably a very filthy pool. The manure from the stables is brought out and dumped into this yard and in addition everything else in the way of refuse from the house. Needless to say, the atmosphere around these middens on warm days in summer might have been healthy, but was certainly not pleasant.

We had been sent down to take over the underground mining at these trenches to meet what the Third Army termed "an urgent situation." It was well described. The fact of the matter was that the Germans had by extraordinary underground activity succeeded in forcing the French and British to abandon the majority of their advanced trenches in this neighborhood. No Man's Land looked like the view one gets of a full moon as seen through very strong telescopes with its numerous craters and shell-holes.



Sector near Neuville-St.-Vaast, Vimy Ridge trenches, April 3, 1916.

View taken from an airplane, showing the British and German front-line trenches and mine craters.

The aeroplane photograph shows the state of affairs when we reached the trenches. The pock-marked appearance of the ground will be noticed. All the smaller marks are shell-craters and the larger or real craters those formed by mine explosions. Note also how the Germans and British have run saps or trenches out to them from their front lines. The Germans had blown mine after mine, sometimes as often as 2 or 3 a day on less than a 500-yard front, until they had succeeded in making life decidedly unpleasant for the poor infantrymen holding these trenches. Whole platoons of men at a time had been engulfed in these terrific mine explosions, which were being blown at all hours, but principally at night. Things were so bad that, when we arrived, the most advanced trenches were practically abandoned, only being held by a few isolated groups of bombing sentries and Lewis gunners for a few hours at a time. The later aeroplane pictures show the state of affairs some six weeks later. By the beginning of July approximately twenty more craters had been fired by the Germans and ourselves in No Man's Land and the trenches adjacent. Unfortunately, I was unable to obtain an aeroplane picture taken at that time. There was an observation-line ahead of the firing-trench; most of our mine-entrances started from this most advanced line of trenches. On some occasions we were left alone underground without any one on top, that is, without any infantry. When this happened we usually posted our own sentries. One night when it happened that no sentries had been posted in one of our trenches, the Huns came over on a short and sharp raid, and actually occupied for a few minutes the trench above us under which we were working, while we continued our work quite placidly below, not knowing what was happening on top. The Jocks, bombing their way through from the firing-line, very soon took care of them, though some Huns got away in the dark.

With the exception of my experience during the Somme offensive, I have never seen anywhere more corpses in the trenches than here. They were so numerous that one could not cut out a new trench thirty feet in length without unearthing as many bodies. All of them were six months old, and the summer was coming on. The barbed wire in No Man's Land was not a pleasant sight. Bodies were tangled up with it everywhere, and the wire in many places was supporting bodies, or at least skeletons, still covered with their tattered uniforms. This was a gruesome sight to us when working at night on top—ghastly and pitiful. During the day the air was heavy with the sickening smell. The only way we could improve matters at all was by smoking hard. Quicklime was provided, but not used in sufficient quantities. I always felt sorry for the few men I ran across who did not smoke. When we first walked up the trenches we would notice what were apparently boots sticking out of the sides of the trenches. On closer examination we would find that there were feet still in them. One particularly callous old Scotch sergeant of ours who used to lose himself frequently adopted the habit of chalking direction signs on these boots.



The same sector, Vimy Ridge trenches, May 16, 1916.

The same points can be easily identified on both pictures. The new mine craters show up plainly.

Some of the dugouts were pretty bad too; we were not inclined to be too particular, but on occasions when it was just a little too strong we would organize search-parties to discover and remove the usual source of the trouble.

Enemy aeroplanes were very active in this sector, and the Boche fliers evidently had sharp eyes when it came to detecting new dugout or mine construction. It was necessary to camouflage all our spoil very carefully, otherwise we could always rely on these spots being shelled or trench-mortared quickly. There was much flying on moonlight nights. Searchlights back of our lines would pick out the enemy planes, and the "archies" at once get very busy. Usually we did not pay much attention to enemy planes, but they had a way of intruding themselves at times which was decidedly disagreeable. They would sometimes rudely interrupt our games of cards in the mess back at our billets. One night they dropped five bombs in quick succession which landed within twenty yards of our Nissen hut, the usual corrugated-iron structure. It was not often that we could afford the time and material for dugouts at our back camps, and as a result the shelling and aeroplane bombing generally was watched with much interest. The flying men at the front are not "fair-weather" aviators. They go up under almost all conditions of weather. Some wonderful flying is seen. All the loops, etc., seem of small account in comparison with the daring nose dives, side slips, and falls of both British and enemy planes. Most men get the flying fever. I applied for transfer to the flying corps in May, 1916, and was passed by the examining officer in the field, but fortunately, perhaps, for myself, my application was turned down by the corps, engineer officers being somewhat scarce at the time.

Souvenirs of German bombs, trench mortars, etc., were much in demand, and some of us were foolish enough to take the detonators and charges out of "dud" T.M.'s, etc. I did this on several occasions, but not without taking every precaution possible to insure against accidents. "Dud" shells are those which have for some reason not exploded because of defective fuse or some mistake in firing. I brought back with me several duds which happened to fall near me and did not explode. Some of the infantry seemed to think that it was a favorite pastime of the engineers to extract the detonators from these duds, and we would often take them out for them, but were at last obliged in self-defense to abandon such a dangerous vocation. I would not handle a dud shell now for a million dollars.

The difficulties of obtaining baths in these trenches at that time were many. The poor infantry would be occupying the front and reserve trenches for a month or six weeks at a time, and it was impossible for them to obtain a bath during this whole time. This hurt more than anything else. We were a little more fortunate in the engineers, and could average a kind of bath about once a week when lucky. Our efforts to get a decent bath with about a half-pint of water were most amusing. Water was very scarce. The rats and beetles in the trenches were large and active and did not add to our pleasure. At night the rats come into their own, and when times were quiet we would pull off some interesting rat hunts and incidentally get some good revolver practice.

Our dugouts in the Vimy Ridge were fairly safe, and after we had been below for a short time, and especially when there was a heavy trench-mortar "strafe" directed in the trenches above, it was not much fun coming out of them. Your heart would be in your mouth as you came up the steps and emerged into the blackness of the trench above. After a few minutes in the trench, however, one would get used to it.

We fell heir to a number of French shafts and galleries which had been driven in for a short distance; some of these we proceeded to continue, and others to abandon. Nearly all the German galleries and tunnels were in the chalk at depths varying from 80 to 150 feet below the surface. There was a top-soil of sandy clay averaging in thickness from 1 to 30 feet, covering this hard chalk. In military mining in chalk and clay it is important to remember that the work by extreme care can be conducted practically noiselessly in clay, but it is almost impossible to work without noise in chalk, especially in the chalk of this district, which contained so many flints. We used the usual rough hand methods in tunnelling here; namely, the pick and shovel. The ring of the pick in striking a piece of flint could be heard by the ear for a distance of 80 feet, and with the listening-instruments we used to hear a pick up to about 200 feet.

Our best defensive plan here was to start in with a strong offensive, so we proceeded to put in a number of tunnels in the sandy clay top-soil. This we did on account of the fact that we could work in the clay at about double the speed of that in chalk and, in addition, work noiselessly. It was a risky game on account of the fact that the Huns were nearly always below us in their chalk galleries, and if they heard our work could quite easily fire their mines and rid themselves of the hated British.

This district around Neuville-St.-Vaast and La Targette has witnessed some very hard fighting, and even the last terrific battle of the Vimy Ridge was neither the first nor the worst of the battles on this sector. Some six months before my company reached the scene, in September, 1915, the French and Germans had met in some terrible struggles. Nothing was left of the villages of Neuville-St.-Vaast and La Targette but a heap of crumbling bricks here and there. The casualties were ghastly. The total casualties for the attacks in this region were estimated at about 150,000. The French had succeeded in capturing the German lines—but at a terrible cost. The trenches were so numerous and mazelike that the district is named "The Labyrinth." It was certainly a puzzle to get in and out. We would enter the communication-trenches at a point near the crossroads at Aux-Rietz, where our billets were situated on the main Arras-Souchez road, and walk up the communicating-trenches as hard as we could go for three-quarters of an hour before we reached the front line. The trenches retained the names left them by the French: Boyau Zivy, Boyau Bentata, etc. It took us several days to get our bearings here. It is seldom a pleasant business taking over new trenches. Just about the time you get hopelessly lost, Fritz thinks it's the correct time to start a bad trench-mortar strafe, and your efforts to find any sort of cover always prove unavailing—no dugouts or shelters are to be seen for miles around.

The French officers whom we met were of the typical polite and considerate order, and very hospitable. Instead of the usual British "whiskey and soda," we would be invited to a drink of real "eau de vie," or French brandy, when we visited them in their shelters and dugouts. Another man and I were entertained the second day after our arrival by the French engineers at luncheon at their mess at Marouille. Seven courses were served to us, with suitable wines. The supply of crockery was limited, and we had to use our own jack-knives, but these trifles did not interfere with my appreciation of the best meal I had had since leaving California. We afterward found out that their cook had formerly been the head chef of the well-known Holborn Restaurant in London.

I took in the first shift to work on our new mines. On our way up I met Colonel A., the controller of mines for the Third Army coming out. He gave me the disquieting information, just received from the French, that I might expect Mine No. 806 to go up that night. "Seven o'clock is the Hun's favorite time for firing," was his last remark. It was then about six-thirty, and as we were forced to pass this mine in order to place our men near by, we thought we would hurry along. As a matter of fact, Fritz did not blow this mine until some two months later, though his gallery was not more than ten to fifteen feet away from ours all this time. We did our best to make the Germans fire by rigging up a dummy pick and operating it regularly and using other devices. The enemy would often keep us on the anxious seat with tunnels like this.

When we started our operations, his tunnels in many places were right underneath us, and these he would work intermittently, firing some and holding others to fire later when he thought he could take us by surprise and do the most damage. It was always a great relief when he finally exploded these delayed mines, and after investigating matters we would immediately hike along to a near-by dugout and celebrate. This state of affairs continued for about three weeks, at the end of which time we had pretty well figured out, by listening carefully everywhere, just where his tunnels were.

We had been welcomed with open arms by the British infantry. The poor fellows were having a bad time, especially in the advanced posts. The old Fifty-first (Highland) Division were then holding the trenches there. Very few of these gallant Scotchmen, or "Jocks," as they are called, are alive to-day, for after leaving us they went into the Somme offensive, and there lost at least half their number, and the other half fought in later battles with the same percentage of casualties. But this is only too common. These Scotchmen were great fighters, and liked nothing better than meeting the Hun on anything like equal terms, and would positively revel in any attempt of the enemy to raid our lines. The latter would only occasionally try this, however, and never outstayed their welcome. All these Jocks were veterans and very handy with the universal Mills hand-bomb. Thousands of these bombs were furnished, and could be found in haversacks placed in bomb-boxes and located everywhere around the front lines (see illustration). In the trenches these bombs are always carried with detonators in them, and the only operation necessary is to withdraw a cotter-pin which holds the spring-release down. Directly the pin is taken out, the spring is released unless the bomb is held correctly, that is, with your fingers around it. The bomb explodes five seconds after the spring is released, so this little precaution of

holding down the spring-release with your fingers must be observed. It sometimes happens that men forget to pull out these cotter-pins. One night one of our husky Jocks, in the excitement incident to a small raid on the enemy, forgot to extract the pin, though I was told he threw the bomb with such force, and good aim, that it completely split the skull of the poor Boche it was aimed at.

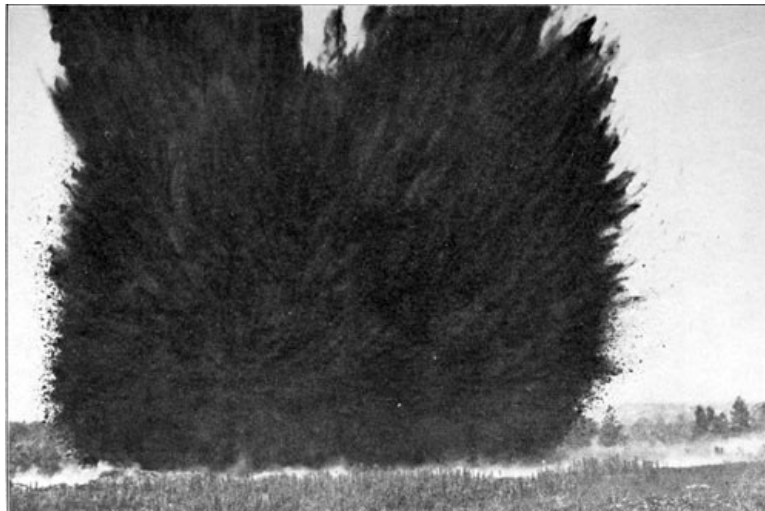
It was a different matter, however, when it came to mines. They would fight anything they could see, but were admittedly not pleased with the prospect of mines going up under their feet every night. The poor fellows who had to hold the most advanced posts, mostly bombing sentries and Lewis gunners, did not at all relish the alarming regularity with which the Germans blew their big mines. No wonder they were glad to see us. The poor infantryman gets enough hell on the surface and from the air without adding troubles from below. Ask any troops who have held trenches where mining was going on. Nothing will induce them to go below in our mines. As one lad said to me once: "Blime, I'd rather go over the top any day—why a V.C. wouldn't tempt me to go down that blooming 'ole."

CHAPTER VI

CHALK CAVERNS AND TRENCH MORTARS

BOTH the Germans and ourselves used huge mine-charges in the chalk and the effect of the explosion of many big mines is spread over a large area. We always felt the shakes in the ground even back in our dugouts at Aux Rietz, over a mile away; while in the forward trenches we had all the excitement of a regular earthquake. All dugouts would shake badly, timbers would be loosened and many men buried in other dugouts and shelters, while sleeping. The firing of mines at night or just about dawn was a favorite practice. Just about the time you have turned in on the floor of your dugout to get an hour's badly needed rest, the earth is shaken by a heavy mine explosion. Pleasant dreams of your home in California's land of sunshine and flowers are rudely interrupted. You grab your tin hat, gas-helmet, electric torch, and hurry up the steps to the dark, ghostly trench. Often it is raining hard and none of the sentries on duty in the trench above know exactly where the mine has gone up. Sloshing through the muddy trenches and dodging the trench-mortar and machine-gun fire which always form a part of the programme in a Boche "blow," you reach the scene of the explosion as fast as you can, fearing the worst, but often relieved to find that your boys are all right and that only minor damage has been done to your galleries. After visiting your own mines, you come up again to be met with a report that several bombing sentries have been buried in their trench as a result of the mine shake. Rescue-parties are hastily organized, and endeavors are made to reach them under a perfect hail of bullets, all working frantically to dig them out from the thick mud and slimy sand-bags. Sometimes we are successful. Many times I have heard the poor fellows call for help, but despite all our efforts, we could not always reach them to dig them out before they were fatally injured or completely buried. I have experienced the sensation of being buried and partly buried by shell explosions as well as mine explosions at different times. The first few minutes before you are dug out are not pleasant ones.

The opposing trenches here were very close in places. Where craters had been blown, the Boche would often occupy one rim and our fellows the other. Some of the smaller craters were only about fifteen to twenty yards wide. Curiously enough, the fighting at these points was not as fierce as might be inferred. It seemed to be a case of waiting for the other fellow to start something.



Explosion of a mine.

Both the Germans and ourselves used huge mine-charges ... and the effect of the explosion of many big mines is spread over a large area.

Most of the craters, big and small, were more or less consolidated by building narrow, winding trenches out to them from the front lines, and then cutting trenches in the rims. Sentries would be posted at good observation-posts overlooking these craters, and it was an unhealthy practice to take your evening stroll there. In the course of my duties it has been my misfortune to be reconnoitring these craters on some occasions when bombs or T.M.'s have burst in them, and the sensation is not pleasant, although one is not so likely to be buried as when shells or mortars burst near in a trench. There is no cover of any kind to be had. Those craters near our lines would be very useful to us as they would serve as receptacles into which we could dump our spoil. A number of the trenches here, as elsewhere, ran right across No Man's Land from the Hun lines to ours, and these would be blocked on both sides in some way or other, either with barbed wire or breastworks of sand-bags, etc.

Our advanced billets were within 100 yards of the villages of Neuville-St.-Vaast and La Targette.

Both of these villages were levelled by enemy fire, nothing remaining but a mass of ruins. All the cellars were used by troops as billets. We were lucky enough to get a very decent old French officers' dugout by the side of the road, with about six to seven feet of earth cover. The timbers of the structure were substantial, and lucky it was for us that they were for we were very heavily bombarded by the Hun artillery. Our men had very curious billets. In this part of France and for some distance south the subsoil is a hard chalk, and this has been quarried underground nearly everywhere, leaving a clay top-soil and good grazing-land above. The houses and buildings are constructed of chalk building-blocks with brick foundations. Every house, also, no matter how small, has a cellar. These cellars are not proof against direct hits with enemy artillery, but they can be easily reinforced and are exceedingly useful in any case.

Chalk caverns are numerous, and one of the large variety was handed over to us as a billet for our men. Although our entire company was about 600 strong, we had plenty of room for 400 or 500 extra men in this cavern, and for a long time we took care of over a thousand there. It was in decidedly bad condition when it was turned over to us. The air could almost be cut with a knife at that time; however, we put in another upcast and managed to clean it up as well. As it was over 70 feet deep, there was no loss of sleep from enemy-shelling activity. Stories were current as to a big fight which had occurred down in this cavern in the previous September, and I should judge that there was some truth in the report, on account of the large French cemetery at the crossroads above and the number of bodies which we unearthed below in the cavern.

These caverns exist almost everywhere in Artois, Picardy, and the Somme district. Under nearly every church there are big caverns or crypts. At Foncquevillers in some large crypts under the church we stored millions of bombs and trench-mortars, and stores of ammunition, altogether sufficient to blot out the whole of the German army. An interesting way of salvaging and sorting the Mills hand-grenades in one of those crypts was practised here. The bombers would sit around a circular iron tank nearly filled with water. Halfway up the sides of the tank clay sand-bags were placed. When a bomb-fuse started to fizz, the bombers would quickly drop it in the tank, where it would explode at the bottom and do no harm. Some of these caverns existed also right in our support-line trenches, and it was common opinion that old galleries in the chalk ran under No Man's Land and across to the German lines.

The ruins of an old mill located just behind our firing-line was suspected of having a cave under it. Upon investigation we found that old tunnels formerly existed there but had caved in. However, the enemy had so many tunnels all around us that it kept us jumping sideways to keep informed as to all of them. This mill was a favorite target with the Hun, and therefore not a popular rendezvous for us. Some very stout-hearted gunner officers had adopted it as an O.P. (observation-post), and had reinforced it with a strong corrugated-iron elephant frame. No one disputed their claim to it. A few days after, the whole business, frame and all, went up in smoke as the result of a direct hit with a Boche eight-inch. It is a custom for engineer and artillery officers to "spy out" the land around the trenches by day and night, intent on their own fell designs, often alone, in distinct disregard of existing orders, which do not allow officers to make their rounds in the trenches unaccompanied by an orderly or N.C.O. Mining officers in particular were the worst sinners in this respect, and our men were often arrested and very nearly shot before they established their identity.

I met one of my own N.C.O.'s one day coming along the firing-line closely following an officer whom he had suspected of being a spy. The officer's hands were held high above his head, while B., usually a quite mild, inoffensive sort of chap, was threatening him fiercely with a jab from his bayonet if he opened his mouth or made any strange move. The situation was highly amusing. The young officer was protesting strongly against such treatment. It appeared that my man had caught him below in one of our mines asking foolish questions. We took him along to the nearest company headquarters' dugout and let him go after he had satisfied us that he was all right. I'm willing to bet that he didn't attempt any more mine explorations without proper credentials.

My only experience with a real spy was in these trenches. One day I met a very pleasant-spoken artillery officer, had a few words with him as he passed my dugout, and offered him a drink, which he refused politely. It may have been fortunate for me that I was called away hurriedly to attend to some work. Later in the day I heard that my acquaintance of the morning had turned out to be a German spy, and, I understand, was lined up against a wall a few days later. He had what I thought was one of the most natural British accents I have ever heard.

In taking over the troublesome galleries below ground from the French, they had neglected to provide us with any surveys of the mine system, so it was necessary for us to make some. Our usual method was to use a compass and a fifty-foot tape and make surveys between all mine-shafts and then carry them below. The work below was all right, but in the trenches above the necessity of keeping one eye on the compass and the other constantly on the lookout for trench-mortars was rather disconcerting, and many readings and measurements had to be repeated. It was a case of "let George do it" when surveys of any close-up trenches had to be made, and the newest joined officer usually found it included in addition to his other duties.

The charges we used in our deep mines in the chalk were tremendous, mine-chambers being loaded with anything from 1 up to 50 tons of a high explosive twice as strong as dynamite. Last year in the battle of Messines the British launched their first big attack by firing a large number of mines below the enemy trenches, using charges of from 15 to 50 tons in each mine and exploding them all at the same moment, the "zero" minute, or exact time at which the infantry go over the top. Very close to a million pounds of a remarkably high explosive were fired at the same

instant by the engineers on this front. In starting an infantry attack the mining officers, in common with all the officers of the units engaged in the attack, synchronize their watches, and at the second planned, push home hard the handles of their blasting-machines. Earth-racking mines are detonated with terrific force. The craters formed from these explosions are often over 300 feet in diameter and from 50 to 150 feet deep. Whole companies of men are engulfed, all trenches within a large radius totally destroyed, and many additional men buried in their fall.

So intense was the fighting below ground in our operations on the Vimy Ridge that we would explode sometimes as many as 4 separate mines a night on our own small company front, only 500 yards in length of sector. In one of our clay galleries we reached the enemy trenches and, passing under them, ran into the timber of one of their mining-shafts. Carefully cutting a small hole through one of their timbers we listened there, relieving each other from time to time for nearly twenty-four hours. We would carefully crawl up to our listening-hole and sit tight in the dark, hardly daring to breathe. We had struck the bottom of the Boche shaft and could hear them talking and even see occasionally the enemy miners as they passed up to their own trenches. Our knowledge of German was unfortunately extremely limited, but no interpreters could be obtained or persuaded to join us at this spot. I can't blame them. We finally fired this mine and three others also under their front line at the same time, blowing their trenches and many Huns sky-high. A small party from the "Black Watch" followed over on a fast raid and reported on their return that very little trace of enemy trenches could be found for 200 yards, everything having been totally destroyed by our mines.

Another time we were tunnelling through with a four-foot-six-inch by two-foot-six-inch gallery in the clay, but right on top of the chalk formation. The floor of the gallery was only an inch or two above the chalk. The enemy workings must have been about ten feet below our gallery and in the chalk. We could hear them very plainly at work, so continued progress on our tunnel without a sound, and presently, as they came very close, could hear them talking. We then loaded a small charge, about a thousand pounds of high explosive, at the end of our gallery. Sitting tight and listening carefully, we waited until they had passed under and just beyond us. A few hours later the listeners reporting that they were at work again on the face of their gallery, we fired our camouflet with the blasting-machine from the trench above.

A camouflet is a small mine explosion which does not form a crater, and is calculated to destroy underground workings. One does not always have pleasant reflections after some of these operations, but we all stand the same chance. If the enemy fires first, we go up, and vice versa. So the game of wits below ground goes on. Sometimes we score, and sometimes Fritz outplays us.

One night a runner brought down the news to us at our dugout at Aux-Rietz that the Boches had fired a camouflet in our "H" mine on the extreme right of our sector. Everybody below had been killed from the resulting concussion and poisonous gases developed. Fortunately there were only seven sappers in the mine at the time. The officer on duty and three other men had gallantly attempted to rescue some of the poor fellows by going below in oxygen-breathing apparatus, but had themselves been gassed, and were only rescued with difficulty. After the gas below had dissipated sufficiently we were able to recover three of the bodies, but those of the other four men were never found. A Church of England chaplain came up a day or two later and read the usual short army burial service at the top of the mine-shaft, surrounded by a few of the comrades of the dead soldiers, the latter reverently attentive and much impressed with this unusual burial.

The enemy trench-mortar fire on the surface was particularly bad. We reached a stage where we thought nothing of shelling as long as they did not throw in a number of T.M.'s, as they are called. These trench-mortars vary in weight from 5 to 250 pounds, from aerial darts to heavy minenwerfers. Their trajectory being steep and their velocity not very high, we could see them turning over and over like a football in the air, look out for them, and in many cases reach cover before they dropped. However, this was not easy. One could always see the trench-mortar which was going to land in a trench about a hundred or more yards distant, but those T.M.'s which were coming straight for you kept us guessing as to whether they would land in our fire-bay or the next. We usually guessed wrong.

Our casualties from these trench-mortars were heavy. Ten of my men were coming in to report for duty one afternoon. They were working at mine "F," and the trenches by which we approached this shaft were always subjected to intense bombardment with T.M.'s, and at many places almost completely levelled by this fire at regular intervals. When this happened the wise man would bend almost double in passing along or crawl over the obstruction on his hands and stomach so as to avoid observation. On this afternoon we concluded that some of our lads had exposed themselves in going up, or that the Boches had located the entrance to our shaft. Directly they reached the entrance a heavy trench-mortar burst among them, killing six and wounding another. Four of the bodies were hurled down the shaft.

These T.M.'s are bad things—the burst results in inflicting multiple wounds. I have seen a number of poor fellows hit in over twenty places from one T.M. The medical people have a busy time fixing them up. Many, however, recover.

Another time in coming up a communication-trench we found the body of one of our boys lying in the bottom of the trench, evidently hit only a few minutes before. The poor chap was dead, but curiously enough we could only find one wound—that in his shoulder. He must have been killed by the shock of the explosion. The T.M. had burst about five feet from him. In my experience this

has seldom happened, but I understand there are many authenticated cases.

As in the infantry, the majority of our casualties occurred from day to day, from one to two or three and more almost daily. At any rate it does not take long in every-day trench warfare to lose half of any company.

At other times, when, for instance, troops are relieving other units in the trenches, or perhaps in large parties at crossroads coming up, the casualties from shelling are very large. One night in Flanders a party of our men were going up the communication-trench when a Boche five-point nine (5.9) burst on the parapet near them. Of this small party of thirty, only fifteen went on to the front line, seven being killed and eight wounded. At the crossroads entering Hébuterne from Sailly, a particularly hot place, and one that I know very well, having been billeted in a cellar within a hundred yards from it during two winter months I have known as many as seventy casualties from one shell-bursting. Every day one either sees or hears of large or small parties being blotted out by enemy shelling.

The division we were with provided us with working-parties day and night to assist us. Usually the parties came from the infantry, though the cavalry were also used a good deal. Here we received parties from the cavalry, infantry, and cyclists. As I understand it, the cyclists are intended to support and relieve the cavalry at night on the few occasions when they can be used in open warfare. I don't think they had the chance very often. So far the cavalry have been out of luck in this war. Both the cavalry and cyclists have been doing trench duty now for a long time.

On the Vimy Ridge a number of East Indian cavalry units were given us for working-parties. These were mostly regiments of lancers, and were composed of Sikhs, Rajputs, Pathans, and many other tribes or sects of British Eastern India. The Sikhs were particularly fine men, tall, well built, quiet, and exceedingly dignified. They always wore their big white turbans. It is a mark of caste with them, and nothing will induce them to part with these or wear anything else. They even scorned the use of the steel helmets which had just been issued to us. We did not. Many of us, myself included, owe our lives to the use of these steel helmets. The other Indian troops always wore the steel helmet.

These native troops had what was to us a very unpleasant habit of carrying everything on their heads. We did not object to this procedure back of the line, but when they carried all the mine timbers and other supplies right to the fire-trenches in this manner we thought it wise to stop the practice before the Huns blotted us all out. Fritz would observe these little parties very easily by reason of the fact that the timber would invariably show above the top of the trench as they came up and would make us the target for a little more T.M. practice. I used to cut ahead across the top and jump down into a trench they would have to pass, and there make every man take his piece of timber from the top of his head and tuck it under his arm. These fellows did not like the T.M.'s any more than our boys did, but after a time treated them in the same casual, cheerful way as the others. I heard an infantryman once refer to these native troops, in the hearing of one of their British officers, in rather a disrespectful way. The way that officer lectured the offender was good evidence of the friendly relations existing between the British officers and their native troops. The latter, in turn, think a great deal of their British officers, and look after them with an almost fatherly solicitude. They had their own native officers also, many of them being sons of rajahs or native princes of India, educated for the most part in the big English public schools and colleges. The cavalry "brasshats" (as the British call all senior officers) of these units visited them often in the trenches. They were all in the trenches for the first time, and much interested in everything. So many of them called at our dugouts, and in company with us inspected our work and the trenches generally, that we felt like regular Cook's tourist guides. They were all mighty fine fellows and without exception aching to get a chance at the Hun, and chafing a great deal at their forced inactivity. They had hopes then of getting in a real charge in the possible open fighting of the coming Somme offensive.

CHAPTER VII

AROUND THE VIMY RIDGE

ALL this time the fighting around us was fiercely waged. The Vimy Ridge was even then noted as being one of the "hottest" parts of the line, and the mining activity all along these sectors, especially where the trenches were very close together, was much in evidence.

The tunnelling company who were on our immediate left had a very arduous time. One night they lost every single man then on duty in the front lines, all being captured. This happened at a time when the Boche raided their trenches in force and caught them below ground. Whenever the Germans made a raid in any large numbers it went hard with our fellows, because the number of infantry holding the advance posts were reduced to a minimum. However, our boys knew pretty well how to take care of themselves, and to put up as good a fight as the infantry. Well they might, since they had been recruited from the infantry to organize our tunnelling companies. Nearly fifty of our men had been in active service since Mons in 1914, and most of the others had been "over the top" on numerous occasions with their old infantry battalions. In addition many were old regular soldiers of long service in India and elsewhere. Nearly all of them had been wounded several times and looked with more or less scorn on the fellows who at the front wore the gold stripe for wounds. They were a tough crowd, no doubt, but certainly some of the finest fellows under the sun, and they would follow their officers through hell itself. Back in our rest-billets we had our troubles with them, but never anything serious. As long as I live I'll take off my hat to those lads of the 181st R.E.

Our advanced billet at Aux-Rietz was not exactly a health resort. Our own artillery was scattered all around, and we came in for a lot of enemy fire directed evidently at counter-battery positions. Our men in the large cavern were all right as long as they stayed below, but you can't keep men below all the time, so we had our share of hits. In our officers' dugout we were fairly safe, too; that is, it was proof against everything but direct hits with heavy shells. Though they plastered the ground all round us, fortunately none landed directly on it—much to our satisfaction. Fritz bombarded us often with lachrymatory shells, the tear-inducing variety, and this was most unpleasant, but nothing more. Later we had our share of gas-shells containing hydrocyanic acid and other gases.

Opposite our cavern at the crossroads was the ruin of an old estaminet which had been used for storing an immense quantity of French bombs, and the latter had never been removed. As this crossroad was a favorite target for the Hun we would often speculate on the size of the crater it would make when hit.

In the spring of 1916 we received the glad news of the Russians having captured 100,000 of the enemy on the eastern front. Hope springs eternal, etc.—many of us thought that six months would finish things up, and were willing to bet on it.

A new division came up about this time to relieve our old friends of the Highland Division. It was the Sixtieth (London) Division, just arrived from England after a year's training there. Very interesting it was to us to compare this division with the last. They certainly made good. By this time, also, I fear that most of these lads have joined the others who are resting below the pitiful little wooden crosses so common in France.

At that time they exhibited all the common characteristics of new troops going into the trenches for the first time. Naturally enough they were jumpy at first, and well inclined to follow their first instructions of feeling out the enemy and not starting anything unless friend Heiny got busy first. This quiet state of affairs, however, did not really please them, and nobody was much surprised or grieved when their colonel, from the depths of a dugout in the support line, telephoned in evident exasperation to the various company officers: "For God's sake, let's get on with the war."

As we knew the trenches well, they would come to us often for advice and information. With regard to mining alarms, our orders were not to alarm the infantry or withdraw them from dangerous posts until absolutely necessary. Many questions were asked us as to the state of affairs below ground, but we were guarded in our replies. A couple of weeks later three of their Lewis gunners, occupying a rather isolated advanced post, were captured by a small enemy raiding-party. This naturally made them angry and they *strafed* the Hun fairly consistently for some time afterward. As time went on and they became more confident, they staged a number of very successful little raids, seldom returning without a prisoner.

Our first dugout was in a communication-trench called the Boyau Bentata, and about twenty yards from the junction of this trench with the firing-trench, here called the Doublemont Trench. This junction was evidently well known to the enemy, who pounded the spot regularly with T.M.'s. It is unfortunately necessary to keep sentries at points like this, and we took a certain morbid interest in noting the casualties at this place. They were many. I had to pass it a dozen times, at least, during the twenty-four hours, but always happened to be in a hurry. There are many undesirable places like this in the trenches. Warning and information as to their location is

always a part of the programme when "trench reliefs" are carried out.

Some daring work is done at night by the various patrols in No Man's Land. No one without experience can understand how easy it is to lose oneself on these excursions. It is absolutely imperative to take one's bearings very carefully before moving far in No Man's Land. Many men wander into enemy trenches. Time and time again we have captured Germans who had become hopelessly lost at night, and who surrendered themselves in our trenches after having spent two or three very unpleasant days in shell-holes in No Man's Land. Our men, too, would occasionally disappear in the same mysterious way.

To a man in No Man's Land at night the enemy trenches and our own look very much alike. Starshells are going up on both sides, and often there seems to be nothing to indicate which is which. As summer came on, the grass in No Man's Land grew very long, and some very daring scouting took place in the daytime, as well as at night. One man in the new division, an Argentine cattle-puncher, would tie a lot of long grass and brush around his body and then slowly crawl around in the daytime, crossing to the enemy trenches frequently. He would pack his bully and biscuits with him, carry a water-bottle, and be away sometimes for forty-eight hours at a time. He did some very good work and brought back useful information as to Hun machine-gun posts and other things, and by infinite care lived for two weeks in this way before he got a bullet through his lungs.

A battalion of the London Scottish were in this division, not all regular Scotchmen, but of Scotch descent. I recall very distinctly the first time I got a working-party of these fellows. They had to work on top of the trenches at night, bucking the sand-bags from our mines, emptying them into shell-holes, mine-craters, etc. I could not help but sympathize with them in the trenches at night for the first time, clad in their short kilts and slipping around in the mud and hard rain on the wet and slimy sand-bags, meantime dodging the machine-gun fire of the enemy. I think they have about nine yards of material in these kilts, and they seem to like wearing them, but I can't say I envied them.

As up in the Flanders trenches, we would often go to the infantry officers' dugouts to meals, especially if anything better than the usual army rations was to be had, and we were often invited to join the Jock officers at dinner in their company headquarters dugout. They had a strange habit of asking their pipers down to play for them at dinner, just as they do back at their camps. You can imagine how the bagpipes, played by a full-lunged Scot, would sound in a dugout thirty feet underground and about six by eight feet in size with five or six big Scotchmen filling the place. The piper was invariably rewarded with a tot of whiskey after his effort.

The arrival of mail was always eagerly anticipated, and we were seldom disappointed. The British Postal Service, which is under the direction of the Royal Engineers, was particularly efficient. In all the time I was at the front, our mail was seldom delayed. We received the London newspapers the day after issue, and the *Continental Daily Mail* the day of issue. My own mail from way off in California was received regularly almost every day, reaching me nearly always three weeks after mailing. My friends in California sent me a plum-pudding, candy, and other perishable stuff for the Christmas of 1916, and it arrived on time and in good condition. The number of parcels alone handled must have been enormous, many officers and men getting their supplies of tobacco, papers, magazines, and other good things regularly through the mail. It has reached such a point that I understand many officers now send their laundry back to England each week-end.

When our turn came around for a rest we would ride back to our camp at Berles. Here we used to have some mighty good times. A third of the officers would usually be out there, the H.Q. officers always, and there was not too much work to do. We would arrange football games for the men, get up matches with other units at rest; play cricket, fix up boxing tournaments, track events, and occasionally visit some of the villages near by. Here at B. we were clear away from any shelling, and got a thorough change. Only occasionally were we even visited by a bombing enemy plane. The summers are very pleasant in France, and we could sleep out-of-doors. Usually our back camps were much closer up, about three miles on an average, and we would be shelled occasionally, but there is nothing much to worry about in camps at this distance except at these odd times. The best billets are usually the fine old châteaux, nearly every village boasting one of these, but the corps and division staffs would usually secure them first.

Back in the rest-billets it was amusing to hear the average man's philosophy on war in general. We all agreed that in the next war, perhaps a decade or so in the future, we would all lean back in our comfortable Morris chairs at the club and patronisingly remark to any young fellow around who was planning to enlist, "Go to it, old man, you're sure a lucky man—only wish I was twenty years younger—I'd be with you," then leisurely pause to light a fresh cigar, order another drink, and continue to read with much inward satisfaction the newspaper man's optimistic account of the latest victories.

An amusing incident happened one night with a new mining officer who at the time was occupying one of our dugouts just behind the firing-line. It was at a time when the German miners were tunnelling all around us and we stood in doubt as to where some of their tunnels extended. One night he sent an S O S call that the Huns could be heard talking to the right of our dugout, estimating the distance at about ten feet. Our O.C., a game little chap, happened to be at the Savoy, our dugout at Aux-Rietz. Receiving this message about 2 in the morning, he hurried up to the scene and, after a very short investigation, discovered that the sounds of enemy mining were the result of one of our own infantry working-parties opening up a new trench just at the

back of this dugout. When satisfied that it was not a practical joke and that the officer had been genuinely concerned, he dropped the matter and did not proceed with the court-martial which the rest of us feared would ensue.

Our O.C., Major C., a former regular officer in the British army, was always on hand when any interesting events were happening, and would turn out at any moment, day or night, to go up to the trenches and assist his officers. In other words, he was a "Regular Fellow," and very popular with his command.

Plenty of fighting in the air was going on all along the front, often two or three fights taking place at the same time. Much interest is taken in them, and we would watch to see them come down. When flying too low they would sometimes be hit by the "archies," or anti-aircraft guns. Sometimes their gasoline-tanks would be hit, and they would then burst into flames, turn over, and fall apparently helplessly for some distance, but in the majority of cases would even then make a safe landing. Other times the enemy planes would come low enough to let us get a shot at them with our rifles and Lewis guns, and we would blaze away, but seldom recorded a hit. All aviators, however, agree that they are not much disturbed by the archies, but strongly dislike machine-gun fire.

Before we left this sector we were inspected by no less a person than the Third Army commander. He shook hands very affably with all of our officers and expressed himself as highly delighted with our success in discouraging the Hun below ground. (By this time the enemy were only firing an average of about one mine a week under our sector of the trenches.) The commander was a very fine officer, but his speeches came with difficulty. At each of the frequent pauses in his address to the company he would turn around and grasp warmly the hand of any officer alongside him. This seemed to encourage him, and he would continue.

About the middle of July we were ordered down to the line opposite Foncquevillers and Hébuterne. We gave up our comfortable quarters at B. with regret. Our work in the new trenches was to construct a number of galleries under No Man's Land, to be used in a coming offensive for ammunition-carriers and returned casualties. The infantry in these trenches opposite the famous Gommecourt Wood had been most unfortunate with the start of the Somme offensive on July 1. It was the most northerly end of the Big Push, the assault having taken place along the trenches all the way from Gommecourt Wood opposite here as far as Péronne on the British front, the French carrying on to the south of this.

According to our information, one of the battalions of this division had gone over the top on July 1, and reached Gommecourt Wood, an almost impregnable position, but through some mistake had not received sufficient support from the division on their left, and had been obliged to withdraw, losing over fifty per cent of their number while doing so. Two other battalions went over near this sector at the same time and were never heard of again. The trees, or stumps of trees, in Gommecourt Wood were laced together so thickly with barbed wire that further bombardment from our artillery only seemed to make it a more impenetrable barrier than before.

Our forward billet was in Foncquevillers. It was badly shelled, but not as bad as our former quarters. It's all a matter of comparison. The pup-pup-pup of machine-gun fire at night echoing through the trees of this village sounded worse than it really was, but we nevertheless were forced to make a practice of hugging the walls pretty closely and keeping behind the street sand-bag breastworks which afforded some protection as we walked around. It was a common sight in walking down the streets of this village by day to see roofs falling in or walls crashing across the road when the building was hit by a shell. Our steel helmets were pretty useful again in preventing the falling tile from drilling holes in our heads. Every roof was broken and tiles fell like leaves. An infallible index of the extent of enemy shelling on the villages close up was to count the number of civilians still living there. The majority of them very close up were totally abandoned by their former residents, while a number of other villages, which came in for more or less intermittent fire, still claimed small numbers of their original population, nearly all women, and mighty plucky ones at that.

In F., as in all villages close up, notices instructed you to "walk on the left side of the road" and in other places to use the trenches everywhere intersecting the village.

Whenever the "heavies" wished to shell the enemy front line the infantry were ordered to withdraw from the front-line trenches. This is very necessary, particularly when the opposing trenches are close together. In the ordinary course of events many men are hit by fragments from our own shells. We used to derive considerable pleasure in watching this close up *strafing* from the support-line.

In the Vimy Ridge trenches whenever we had spotted what we suspected to be an enemy mining-shaft we would take counsel with the trench-mortar officer or gunners and have the location consistently pounded, meanwhile watching with delight many hits which resulted in throwing up blocks of timber, the latter usually denoting a direct hit.

On account of the difficulty of obtaining the right atmospheric conditions for a gas attack, we would often have a number of false gas alarms. The "gas merchants," as they are called by the British, would place their steel cylinders in the parapet front line and carefully conceal them with sand-bags until the proper wind and velocity were obtained. It was usual to withdraw every one

from the front line with the exception of the Lewis gunners. The "gas merchants" had planned to put over a gas attack in the trenches opposite Gommecourt Wood and we had taken our men out several times when it had been found inadvisable to throw the gas over on account of the shift of wind or some other reason. On this occasion I had withdrawn my men from the front line, and an hour later, having learned that the gas attack was not to come off this time, had gone up to the front line again alone by a different communication-trench. In passing along the fire-trench I happened to ask a corporal of a gas crew whether the gas attack was called off for that night. One of their sergeants overheard my questioning the corporal, and, seeing a strange officer alone in the trenches, very properly followed me up for a distance. When I arrived at the scene of our work I found that my men had not returned. The sergeant's suspicions naturally grew, and as I started out again he informed me that I would be placed under arrest until I could identify myself. I told him we would walk around to the infantry commander's dugout and he would vouch for me. As it happened, I had met some of these infantry officers in the morning, but they had only come in that day and did not know us very well. On reporting to the company headquarters, the infantry captain informed me that he guessed it was all right, but that he was taking no chances. I had better accompany the sergeant back to battalion headquarters. These headquarters were at the entrance to F., the village behind, and as I was marched back, with the sergeant closely following, I picked up one of my Irish corporals at their billet in the village. The latter seemed highly amused at my arrest. On arriving at battalion headquarters I established my identity very quickly to the battalion adjutant, but made a mental decision I would be careful about going around the front lines alone in the future.

CHAPTER VIII

THE SOMME SHOW

Two sections of our company left Soastre the next day and proceeded to Albert. In going down we ran into a very severe thunder-storm. The roads were filled with a heavy traffic, troops marching into Albert and to neighboring towns, all going into the Big Push. Immense quantities of supplies and ammunition were being sent down. Shells and ammunition were piled everywhere on rough wooden platforms by the side of the road. Most of the troops were bivouacked near the roads, and on this day were having a very rough time, especially where they were camped in the valleys. Many of them were up to their knees in water and their small bivouac or "pup" tents nearly submerged. The whole of the countryside around Albert was dotted with camps. Inside of a few hours of this rain the camps were simply quagmires. Roads were cut up badly as a result of the heavy traffic, and our progress was slow. For several miles before reaching Albert we could see the figure of the "Madonna Holding the Child" outstretched against the sky-line. This bronze statue is a notable landmark and could be discerned for miles around. It was situated on the top of the Albert church, and the church and tower had been shelled so badly that the figure had by this time almost reached a horizontal position. It was common belief among the French that as soon as the figure fell to the ground the war would be ended.

We found that our billet at Albert was to be in a corner house facing a crossroads from which four roads radiated. Albert was being badly shelled at the time, and our billet had met the same fate as many others. No windows were left in the house and very little plaster on the walls or ceilings. However, we were well used to billets of this description and promptly proceeded to make ourselves as comfortable as circumstances would allow.

The next day we started on our work in the trenches and in the evening I took in my party. We drove up in our trucks as far as the hill overlooking Oவில்liers-la-Boisselle, and then walked the remainder of the way into the trenches which we had to consolidate. We had said good-by to underground mining for a while. Here our work consisted in consolidating the trenches as they were captured by the infantry. I think this night, incidentally my birthday, was the worst night that I have ever spent in the trenches. We had to march in single file, my party of seventy men, separated into small groups, along a road which at that time was being terribly shelled by the Huns. We were obliged to keep to the road on account of the fact that all the trenches captured since the 1st of July by our infantry had previously been flattened out by our own and the German artillery-fire, and only small depressions showed their original location. We marched for the last mile in pitch-darkness in mud up to our knees and passed through several barrages of enemy fire. The bombardment on both sides was terrific. The British guns were so numerous that in this La Boisselle valley they stood almost limber to limber. I had some four guides with me. These men had been up in the daytime and were to take our four parties to our new work here. Three of them lost themselves hopelessly in the dark, but fortunately one lad managed to find one of our dugout positions. The surface of the ground everywhere around was so pitted with shell-holes that it was impossible to find a piece of ground five feet square which did not have one or more shell-holes in it. The bodies of German and British soldiers were lying around us in thousands. The fitful glare from the star-lights and flashes from the guns showed these bodies and portions of bodies lying in every conceivable pitiful and grotesque position. Most of them were lying face down in the shell-holes and almost filled trenches, while others stretched on their backs stared up to the skies with glassy, unseeing eyes. Rifles, bombs, and all manner of small weapons and equipment, German and British, were scattered around on all hands. We had all seen plenty of the horrors of war before and were just fresh from the Vimy Ridge trenches, where bodies also were numerous, but here it was a veritable shambles. These men had all been killed within the last two or three days. Freeman, the reliable guide with me, warned us about stepping on the bodies in the dark. To my disgust, I stepped on a body right away, and in climbing over an earth mound, placed my hand on another. I thought I was pretty well inured to these horrible sights, but my revulsion was so strong that I vomited on the spot. Our men here were working in six-hour shifts. I remained in charge for two shifts, some twelve hours, and I can say truthfully that I was never more happy in my life than when I was relieved in the morning. It certainly was not a pleasant way of celebrating one's birthday. We wanted to bury some of the poor British lads whose bodies we found there, but this was impossible. We did bury a few bodies the next night after taking their identity tags and effects from their pockets. It is impossible for me to even half describe the scenes in these terrible battles known as the first Somme offensive.

We started work at once on some five dugouts. The entrances to three of them were destroyed the first night, some of our fellows being caught in them and buried at the time. Fortunately, we were able to shovel them out not much the worse for wear. A working-party of cavalry were assisting us here, and I shared my breakfast of hard-tack biscuit and cheese with the officer in charge. This officer, it appears, was the son of a very wealthy tobacco manufacturer in England and, as his brother officers afterward informed me, the heir to \$65,000,000. No wildcat insurance company even would have insured his life for thirty cents during this time.

Our work was near Mouquet Farm and to the left of Pozières. A mile to our north was the famous

Thiepval. The Australians were fighting all around here when we arrived, but about a week later were relieved by the Canadians. We had some two weeks of this work, going up for eight hours out of every twenty-four. At our back billet at Albert we did not get much rest. The Huns were shelling the town regularly with heavy shells as they retreated, and sleep was almost impossible by reason of the continual rumbling of traffic on the granite pavé road alongside our billet. It seemed to us that the whole British army must have driven past that house. There was no rest day or night on account of this noise. As my brother was with the Canadians, I looked forward eagerly to their arrival. However, this did not mean that I was likely to see him; as things happen at the front, your lifelong friend or your brother may be in the next sector to you and yet you will never know the fact or, even if you do, you would probably never get the chance to see him.

At Albert we were some twenty-eight kilometres from the beautiful city of Amiens. All troops, officers included, have a weakness for this city, and whenever it was possible to get a few hours away from the line, they would try and reach it somehow, on horseback, by truck, or any means of conveyance. We were fortunate in having motorcycles, and, when time permitted, would ride down from Albert to Corbie, get on the tow-path of the river Somme there, and ride into Amiens. The horrors of war were soon forgotten, and we would get a good meal at the Café Godabert or at some other place, and soon feel at peace with the world. An American bar we patronized would furnish us with champagne cocktails and other so-called American drinks, and, if time allowed, we would see a cinema.

In riding back along the tow-path, we would see the Red Cross barges, full of badly wounded men, being slowly towed down. Numerous French and British troops were camped by the river. In summer it was very pleasant there for the troops at rest. This is the country where several of our own divisions are now fighting, brigaded with the British and French troops. We were riding back on motorcycles from Amiens one day along the tow-path when Captain B. rode right into the river and stuck in about four feet of mud and water. It was amusing to watch his struggles from the bank, but when he insisted on our helping him out with his machine, not quite so funny. We put it on the rack and in a few minutes had it going again. They furnished us motorcycles that would stand anything. We had many thrilling rides on these up to the trenches, being shelled consistently. I was lucky enough to get my leave whilst here—seven days in England. I never enjoyed a leave more. The officer who relieved me was wounded in the leg the same night, and now, though still crippled, has rejoined my old company in the trenches. Within twenty-four hours of leaving these terrible scenes of wholesale slaughter I found myself in a theatre in London. Naturally enough, life seemed to be going on much as usual, and I proceeded, as every one else does, to have the very best time possible in the short and infrequent leaves. Not many hours were wasted on sleep during our furloughs from the front. We figured we had plenty of time to catch up on sleep when we got back to the front, but the luxury of being able to take off all your clothes, have a real bath, and then sleep between linen sheets again is never really appreciated until you've lived for months in a dirty, muddy trench.

One of my brother officers was an Irishman who lived in Dublin, where he invariably spent his short furloughs. He went back once when the Sinn Feiners were busy with their revolution in Ireland. On his return he complained that it was more exciting dodging the machine-gun and rifle fire around the streets of Dublin than it was in the front line, but, being a cheery soul, he appeared to have enjoyed to the utmost their little private war in Ireland.

On my way back to France I was held up for three days at Folkestone on account of loose mines in the channel, thick fog, and enemy submarines. Stopping over at Boulogne in waiting for the Third Army train to go up to the line again, I went to the movies at the Kursaal. Curiously enough I saw a film there entitled "L'Invasion des Etats-Unis." I had seen this picture in New York on my way over in October, 1915. The French audience greeted it with much enthusiasm and plainly showed their warm feelings toward our country.

I met H., a brother officer at Boulogne. While travelling together to Amiens we discovered the fact that we had less than forty francs left between us. Economy is not a strong point with men on furlough from the trenches, and I know that most of us managed to spend all of our pay and usually overdraw a month in advance by the last day. H. and I figured that we could get by, but dropping into the Café Godabert in Amiens in a lordly way to luncheon we found to our dismay that our bill was over thirty francs exclusive of wine, which we had carefully refrained from ordering. With our bad French we had ordered "à la carte" instead of the regular meal, and we were obliged to content ourselves with a small packet of malted milk until breakfast the next morning. That luncheon, however, was good.

On my return to Albert I found that my section were now constructing Russian saps and dugouts in the trenches opposite Thiepval, and we were there when the capture of this enormously strong fortress was effected at the end of September, 1916. The underground defenses of the Germans at Thiepval were very elaborate. Many of their machine-guns would be run up on elevators as occasion demanded from the dugouts below. Thiepval had withstood the most terrific hammering and pounding since July 1, of that year.

The tanks were first introduced in the fighting near us in the battle of the Somme, and were very successful.

In going up to Thiepval we drove every day through Aveluy Woods. These woods were shelled with persistent regularity and intensity by the enemy. One day as we were driving up, some shells burst among an infantry party marching just ahead of us on the road. Among the resulting

casualties one of their officers was lying in the road with one leg blown off, while his orderly lay headless a few feet from him. A Tommy called attention to the head of the orderly in a tree near by. We had five casualties ourselves on this particular trip. One of them, not wounded very badly, danced with delight. "Good-by, sir, any message for Blighty," was his last call as we sent him back to the nearest aid-post. None of us enjoyed this daily ride through Aveluy Woods.

CHAPTER IX

THE BATTLE OF THE ANCRE

AFTER some six weeks on the Somme we were ordered to return to Hébuterne and remained there during the operations known as the battle of the Ancre. Our rest-camp was at Souastre, a village some three miles back of the front line. Souastre was shelled irregularly. Whenever our artillery shelled a village behind the Hun lines, the Germans would retaliate by shelling the corresponding village behind the British lines. Retaliation was always a strong point with the Boches. Our work, which was now mostly deep-dugout construction, was in the village of Hébuterne and in the front and support trenches near this village. It had been anticipated that we would have captured the trenches at Gommecourt Wood and the German lines opposite Hébuterne in the Somme offensive, and as a result of this optimism, very little work had been done to repair and revet the trenches in this sector. The rain was rapidly making them almost impassable, despite the constant efforts of the engineers and infantry to repair them. We could hardly move in any of these trenches during the winter without a pair of rubber thigh-boots, and some men, going in or out alone, were drowned in the mud. This was not a rare occurrence. Many men are lost in this way during the winters. Our other sections had been working in an advanced sap which we called the "Z" hedge (British called this "Zed"), and we had continued to carry on repair work in the tunnels under No Man's Land there. It took us about three hours to get up to the "Z" hedge, nearly every man carrying some timber, and another three to come out. Sometimes I have taken a full half-hour to walk fifty yards in these advanced trenches, every step in mud above my waist. The alternative of sticking your head in the mud, ostrich fashion, or getting out and going over the top and taking your chance did not make it any more pleasant. We usually preferred to get out on top. One day the general in command of the infantry brigade visited these forward saps, and as a result we were ordered to abandon them—not however before we had paid a heavy price to hold them. A machine-gun section had set up a Vickers gun in this sap to cover the possible underground approach of the enemy and these parties would often be without rations or supplies for several days at a time. In addition to this, they were unable to light any fires on account of the smoke being seen from the close Hun trenches. Taking the tip from our fellows, they would heat their tea and bully beef (corned beef) in mess-tins with the aid of candles. We always sent up a few extra candles for them. The hedge here afforded a very useful target for the enemy, and they succeeded in planting many heavy minenwerfers around and in our sap. There were two entrances to this. One day just before I arrived a heavy minenwerfer had destroyed one entrance and killed three officers and four men. Those killed, including one engineer officer, had been blown to pieces. One of my corporals, with the rest of the shift, managed with infinite difficulty to bring out the wounded through the heavy mud. We were not at all sorry to say good-by to the "Zed" hedge.



A cellar, protected by sand-bags, in the village of Hébuterne, used as a shelter by engineer officers.

Our billets in Hébuterne were the usual cellars. These we strengthened by piling sand-bags and

anything else we could find on them. Like most other cellars, even when reinforced, they were not proof against heavy shells. We would often sit and wonder whether the next would land right on top. A six or eight inch shell landing squarely on it would have smashed it like an egg-shell. Quite a number of our men and some from our attached infantry working-parties were killed in these cellars by shell-fire. The whistle and swish, too, as they passed over searching for the heavy batteries behind us was not too entertaining. You could hear them as they came, faintly at first, and with increasing sound until they burst with an ear-splitting crump. With experience we could determine from their sound those which were going to explode near. However, one is in doubt for a very few seconds only, though these seconds are very valuable. When walking along a road, which is being shelled you will sometimes have time enough to jump into the trench which is usually alongside all roads subject to enemy shelling. One evening I had just relieved Lieutenant G., who remarked before leaving: "The Huns have a nasty hate on to-day, and have been plastering shells all around the billet." They landed a whizz-bang (77-mm. shell) first about 6 P.M. some seven feet from my cellar entrance. A few minutes later a 5.9-inch shell burst about twenty feet away in the yard, and from eight to ten that evening a dozen landed, all within twenty to thirty yards of the dugout, one of them carrying away the roof of the house next to us, and just missing the end of our cellar. Finally they put a whizz-bang square on the entrance, and almost on top of it a heavy shell which blew down the front sand-bag wall. Fortunately for us we had already built another exit in the form of a tunnel into an adjoining cellar, where the cooks of the section held forth. The shells exploding near had blown out our candles each time, and we patiently relit them, but the last two had in addition blown down half a ton of bricks on us. We were getting decidedly peevish by this time, and when my orderly suggested the thought that was strongly in the minds of both of us—that retreat was in order—we proceeded to put thought into action and moved for the balance of the night to a large, safe dugout near us. The next day I returned to the cellar, but not before putting an extra tier or two of sand-bags on it.

To the right of us there was an advanced aid-post with a mortuary above. This mortuary was in the ruins of a house which had no roof and only two walls. For a time the bodies of men killed each day in the trenches near by were placed here. It was an unfortunate choice. One night my men reported that they had seen rats running over the bodies. Directly I learned of this, we placed sentries to prevent such horrors recurring.

One day we received a request from the brigade to investigate a mysterious crater at the head of Woman Street trench. It appears that an explosion had been heard there two nights earlier, and the following morning it was found that ten infantrymen were missing and a crater some twenty feet deep had been formed in No Man's Land just ahead of the front line at this point. The brigade staff could not understand the situation and requested that an investigation be made at once to determine whether the enemy were mining here and had blown this crater from below ground. As the trenches were some 200 yards apart here mining did not appear probable. I visited the site and later ascertained the fact that an old trench-mortar bomb store had been located there some time previously. We took out a party of our sappers and dug around in the very symmetrically shaped crater. We unearthed some remnants of trench-mortar ammunition-boxes. What happened to the ten men was never definitely known, but we concluded that an enemy shell must have landed squarely on the T.M. store, detonated all the trench-mortar ammunition and blown out the entire gun crew. None of the bodies were found anywhere in the vicinity. The night before our fellows went out to dig around in this crater an infantry bombing-party had been detailed to occupy it. In the morning they were all found bayoneted. A Boche patrol had surprised them. One man in the party who was wounded had managed to crawl away in the dark and escaped the fate of his comrades. As happens so often in this war, the Huns had not been content with killing. On the body of one man were found five bayonet wounds.

This village of Hébuterne was well known as being a bad spot. The infantry preferred the trenches to the village cellars. The enemy shelled the village with unwelcome intensity daily and also all the roads leading to it. Our cellar was some fifty yards from a crossing where the roads radiated in five directions. This spot came in for more than its share of shelling. The fact that numerous artillery batteries were located in the immediate neighborhood added to the intensity with which it was bombarded. The road to Hébuterne from Sailly-au-Bois was also shelled regularly and at almost any hour of the day or night one would see wrecked and burned wagons and dead horses lying around in their harness. I have known as many as seventy casualties from one Hun shell at this crossroads.

We had some four big trucks in regular use and these were kept busy every night in taking up rations, tools, timber, etc., to the trenches. On several occasions we had to "get out and get under" to avoid the splinters from shells bursting near. The drivers of these trucks were plucky fellows. It was difficult to excite them. One night at Hébuterne a 5.9-inch shell burst about five feet from one of our trucks. Six men were more or less badly wounded, but luckily no one was killed. They would drive up at the same even speed every night in the pitch-darkness.

Most of the drivers were hit at some time or other, but always came back as soon as they were released from the hospitals, and carried on with their driving again. Not much time was wasted in unloading these trucks. Often it was done under a rain of shrapnel. When their work was completed the drivers would come into our dugout for their customary tot of rum. Almost nightly in coming up on these roads trucks and wagons would be ditched and hold up a long line of traffic behind them. Frequently it happened that a number were filled with 6-inch or 9.2-inch shells, and the waiting on the road to move on whilst the Hun was spattering everything around us with shrapnel was a little trying. There were some 15-inch guns beside the road at Sailly-au-

Bois, and these came in for their regular share of attention from enemy batteries.

While we were constructing a number of deep dugouts in Hébuterne and in the trenches around, we found a big chalk cavern in the village. This useful place was discovered by a man accidentally falling down a well. On being pulled out, the wide-awake sapper noticed an opening off the side. The cavern was explored and several entrances opened up. Very useful accommodation was in this way provided for a large number of troops.

On the night of November 12, 1916, I was trying to get some sleep in my cellar at Hébuterne when about two A.M. a motorcycle despatch-rider awakened me and handed me the following message, marked "Secret and Confidential."

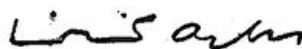
Secret.

148th Bde. No. G. 205/14.

O.C., 1/2nd Field Coy. R.E.
O.C., 181st Tunnelling Coy. R.E. ✓

"Z" Day is to-morrow, THIRTEENTH instant. ZERO hour is FIVE FORTY FIVE A.M.

Acknowledge.



Captain,
Brigade Major, 148th Infantry Bde.

12.11.16.

Interpreted, this meant that three hours later, five forty-five A.M., on the thirteenth, the infantry would go "over the top" on the first assault of the battle of the Ancre. The infantry in the trenches just in front of us were not to be in the attack, but were instructed to throw large numbers of smoke-bombs and maintain rapid fire, the idea being to make a good bluff that they were also going over and keep the enemy guessing in the trenches opposite them. At five forty-five exactly, the artillery around us all burst loose, and the fireworks started. Several batteries of 9.2-inch howitzers, not a hundred yards from us, soon tested the drums of our ears. The twelve-inch batteries just half a mile away also started firing as hard as they could, together with the others all around. The combined noise was naturally deafening, and reminded us of our experiences on the Somme. Above and around in all directions the whistle and swish of the shells made the air seem almost alive, all carrying their messages to the poor devils of Huns opposite us. The return shelling that day in Hébuterne was not intense. I imagine that their guns were too badly needed a little farther to the south. The push was to be made by eight divisions at first, and extended from about a quarter-mile south to Thiepval, about six miles below. We captured the village of Serre, just to the south, but were driven out again. Later on, it was retaken. As in almost every action, villages and points were captured and lost, then recaptured, and so on. A Boche general and his staff, who were at the time inspecting the enemy front lines at Serre, were captured. Beaumont-Hamel was taken the first day, and other villages to the south. At the start we captured over 6,000 prisoners, and our own casualties were very light. The weather then took a change to our disadvantage. The frost disappeared and was followed by rain, which made the ground very sodden and muddy. This state of affairs occurred so often after the first day or two of an attack that it almost seemed as if the weather was in league with the Germans.

Time and again it has happened that the British would capture the first and second objectives and then on account of bad weather developing the attack would come "unstuck" and troops unable to advance at any speed in the heavy mud.

We were obliged often to ride up on our motorcycles at night. Some fellows got used to this and the regular motorcycle despatch-riders do it habitually, but I can't say I ever enjoyed it. To a short-sighted man it isn't much fun. The fact that one of the despatch-riders one night was killed by running into our truck as we were coming out didn't encourage me. I have seen some fellows blown into ditches, and others crashed into walls by the concussion of shells exploding near them. Fast riding is usually a necessity and many accidents happen. I had many falls, but was fortunate enough to only spend one night in an ambulance-station.

The observation-balloon (or kite-balloon) section officers had bad times occasionally. One day at Souastre I noticed one of these "sausages" being carried away by a strong wind. The cable had broken and the wind was carrying the balloon very quickly toward the enemy trenches. As I looked up I saw the first officer observer drop out, hanging on to his parachute. Somehow it failed to open, and he dropped over 4,000 feet like a stone. The other man probably stopped to secure his maps and instruments, and a few seconds later, he dropped. Several hundred feet below the balloon his parachute opened and he came slowly sailing down, some four or five minutes later, fortunately landing in our lines. In the meantime two flying men had raced after the balloon and set the hydrogen bag on fire with tracer bullets from their Lewis guns, in order to prevent it from falling into the hands of the Huns. The poor fellow whose parachute had not opened was formerly a well-known and popular London actor, Mr. Basil Hallam.

Busy as all the engineers were, we couldn't build enough dugouts for all the troops. One day I

went over to a very inadequate and shallow shelter in a part of the front line which was used as a company officer's dugout. They needed a new one badly, and we arranged to start the work the next day. As bad luck would have it, the Boches landed a five-nine on it that same night and killed or severely wounded every officer and orderly in the dugout at the time.

Occasionally some of the men would get what is known as "shell-shock"; most of the cases are undoubtedly genuine, but a small few are suspected malingerers. To reduce the number of the latter, most of the British army doctors required evidence confirming the details of the specific shell explosion causing the shock, that is, when it was not the result of cumulative conditions. My experience is that when a shell bursts very close to you, your heart seems to tighten and jump up. Actual displacement of the heart really occurs sometimes, my medical friends tell me, and the old expression of "one's heart is in one's mouth" takes on a real meaning. Fortunately in most cases as one becomes accustomed to shelling, the shock to the nervous system decreases, and an explosion or concussion which would thoroughly unnerve a new man is taken by a veteran with a nonchalance which certainly shows the development of strong will-power. However, the continued nervous strain tells its tale in gradually lowering the vitality of the men exposed to constant shelling.

CHAPTER X

THE RETREAT OF ARRAS

IN January, 1917, we were directed to proceed from Hébuterne to the trenches near Arras. Our rest-camp was at Beaumetz, a village about two and a half miles back of the lines, and our work was the construction of forward underground galleries under No Man's Land and deep-dugout construction in Arras and the villages and trenches to the south. Another man and myself were billeted at B. with a French family, four generations of whom were occupying the kitchen, while we used what was formerly the parlor. I think we paid Mme. — about five francs a month rent (which is incidentally by way of being quite a contrast to the rent of apartments in Washington this last winter). My forward billet was at Achicourt, a suburb of Arras. This part of the line was then pretty quiet and we were not sorry to get into a comparatively peaceful sector for a while. In Achicourt, a village about half a mile from the Germans' front line, a few civilians were still living. The troops would buy eggs, butter, bread, vegetables, and such like articles from these French residents. Another man and I used to make a practice of going down to the house of a French carpenter's wife and having the usual meal of omelet, "petit pois" or "haricot vert" and café au lait. She was a wonderful cook, as most of the French women are, and seemed to find a good deal of amusement in our attempts at conversation with her. Like many other French women still living in their homes close to the line, shelling did not bother her much. We used to have our meals in her kitchen. The room adjoining, the parlor, had been entirely destroyed by a shell, and several bullets had gone through the window of the kitchen. Shells would often land in the road outside and in the garden at the back while we were at meals here.

Madam B. would immediately order her young son, aged about twelve, and her daughter, about eighteen, to light a lamp and go down to the cellar while the shelling continued. Her husband was serving with the French army at Verdun and returned on a week's "permission" (leave) during the time we were in this village. It amused the Tommies very much to think that any soldier would care to spend his leave in a village so close to the line. We were constantly advising the civilians to move back to a safer area, particularly the women, but the poor people had not much choice. The British army authorities I understand offered to move them all, together with their portable belongings, but they were evidently afraid of having their houses destroyed and their little farms or gardens torn up. Their love of home was stronger than their fear of death, or else they couldn't understand. At any rate, very few of them left, even when the shelling became more active. Many of these civilians were later killed and gassed. We also came in for our share of shelling later at our billets here; the cellars were small and did not provide sufficient accommodation for all of us. Shortly before the beginning of the retreat of the enemy, which occurred on our front on March 18th, they gave us a last dose of heavy shelling. This day they landed at least 100 medium and heavy shells within a radius of 50 yards around us. I had more than my share of close calls during this bombardment. A shell had just burst in the road near our little ruin and I walked out to see what had happened and heard another one coming straight for me. I ran to the nearest wall and dropped alongside. The whizz-bang burst about 8 feet away from me on the same wall. I happened to be the nearest man to the shell, but was only hit with a brick in the middle of my back, knocking my wind out, but not doing any real damage. One poor fellow behind me was killed and two others wounded. Incidentally I got the full concussion along the brick wall, and my ears were ringing for an hour afterward.

I then hurried to one of my section billets to order the men to their cellars. That same morning the Boche had put one shell through the wall of the second story of this building, but as luck would have it we had no men billeted up-stairs. Just before I reached a barn occupied by eleven of my men in the yard of this billet, a 4.2-inch shell burst on top of the east brick wall. Poor Holloway had his head blown off by the bricks, another fine lad, McNulty, was mortally wounded with shrapnel in his lungs and stomach; and six others wounded less seriously. The remaining three were not touched, but were badly shaken up. After covering the bodies of the poor lads who were killed, we bandaged up the other fellows as well as we could and took them down to the aid-post in the village. Infantry quartered in the next house to us had over seventeen casualties from one shell the same day.

After getting all my men in the cellars, I hunted for a cellar myself. This was not easy as they were by this time pretty full. On my way I was caught in several buildings when they were hit. Twice I stood in the doorway between two rooms and watched the tiles falling all around as shells burst on the roofs over me. Presently, I found temporary shelter and stayed there for fifteen minutes until the worst was over. A house with two cellars next to one of our billets and on the same street was closed up securely. I obtained permission from the town major (the officer who has charge of all billeting accommodations in the French villages) to use this billet, providing I could get the consent of a French lady who was acting as a kind of watchdog for the absent owner. Madame — was loth to give her consent. I'm afraid I was not very patient. We had already that day lost several fine lads through a shortage of cellar shelters, so we proceeded to take over the billets anyhow and moved to rooms above the stores of household treasures which had been placed in the cellars for safe-keeping.

Billets near ammunition-dumps or trucks filled with shells were not popular. Eleven large trucks with several hundred 9.2 shells in them were parked in the square of this village for several hours. A Boche shell hit one of them. All the houses surrounding the square were levelled by the resulting detonation and over 200 men killed and wounded. It was impossible afterward to find a piece of wood or steel from these trucks larger than a brick in size. During the retreat it was a very common occurrence for enemy shells to explode large artillery ammunition-dumps in this way on account of the fact that it was impossible to get them under adequate cover. Every night one could count dozens of fires caused by enemy shells hitting the cordite propellant of batteries.

We were billeted for some time in Arras, one of the best laid-out cities in France, which before the war had a population of about 40,000.

It had suffered severely from bombardment in 1914 and 1915. The trenches ran right through the town. The granite blocks of the pavé in the streets had been taken up in many places and formed into breastworks, with loopholes arranged for rifle and machine-gun fire. The Arras railway-station was quite interesting. It had been formerly a handsome and well-built structure of steel and glass. Now the glass was all broken, but the steel frame had remained intact. Along one platform a pavé breastworks, shoulder-high, had been built, while between the rails, many of which were broken, grass was growing. It was a melancholy sight.

We were fortunate enough to be billeted for a couple of weeks in the office of a sugar-refinery. Here we had leather armchairs, desks, stoves, and most of the appurtenances of civilization. Seventy-five per cent of the houses and buildings in Arras had been hit at some time or other; those undamaged or not so badly destroyed had their rooms and cupboards locked and paper seals placed, warning soldiers not to open them. Shells are no respecters of seals, however, so it happened that many houses had been more or less destroyed by enemy shell-fire, and all the furniture exposed to the weather. Although orders against looting were strictly enforced, it nevertheless happened that many dugouts in the trenches in this vicinity were furnished quite comfortably. One would see large mirrors and comfortable armchairs in them, and in some cases even pianos.

There was a doctor's house about four houses away from the one we occupied, and one evening while the Huns were shelling us they landed an "obus" right into the upper story of this house with the result that the two stories were merged into one. The next morning we examined the damage. The house had been very nicely furnished and a piano and some armchairs were untouched; but everything else was badly wrecked. So the work of destruction goes on—a shell breaks open a house and lays the furniture open to the weather, which soon spoils it.

The trenches here had been occupied by the French until the spring of 1916, and they had also evidently made themselves as comfortable as possible. Before the retreat and during the day all stores in Arras would be closed, and the city was apparently almost deserted, very few soldiers being seen on the streets; but at night things were very active, troops marching in and out at all hours, and all supplies going up. Such stores as remained to do business were open from six to eight in the evening. There was one street, the Rue St.-Quentin, which had been dubbed "piano row." When we reached Arras, this was a street of ruins, but an infantry officer whom I met here told me he had been billeted in Arras in the previous spring and that every house in this street then had a piano in it. Not even a chair was to be found then. A number of French gendarmes and British military police were protecting the property of former residents and enforcing army regulations in regard to looting. The troops sometimes used the furniture found in the houses, but took good care of it and handed it over to the parties succeeding them in these billets. To be sent to the Arras sector before the retreat was an "end devoutly to be wished for" by all British forces.

Previous to the German retreat one of our sections working with a New Zealand mining company, had opened out all the old sewers of the city and constructed tunnels in the chalk through to the front trenches, and in some places these tunnels were continued as far underground as the Boche support-line. During the battle of Arras thousands of troops would be marched up the main St.-Pol-Arras road, and then underground to come out on top again at the Boche second line.

In February I obtained another leave to England, and crossed during the first week of the widely advertised 1917 Boche submarine blockade. The U-boats did not bother us much in crossing the Channel, however, as we always had torpedo-boat escorts. During the nineteen months I served in the trenches, I had four furloughs, and in this I was particularly lucky. As a matter of fact, leave for most troops was often cancelled, especially for a few weeks previous to a big offensive, but as our tunnelling companies did not obtain the usual divisional rest behind the lines, we were always allowed our furlough, and mighty welcome it invariably was. It happened frequently that infantrymen would just reach England for a ten-day leave when they would receive a wire from their commanding officers informing them that their leave was cancelled and ordering them to immediately rejoin their unit back in the trenches. This was the epitome of bad luck and resulted in much gnashing of teeth and profanity generally.

For a week previous to March 18 we had noticed many fires in the enemy lines and heard numerous explosions in the villages behind their trenches. Everything seemed to indicate that the enemy were preparing to retire along the trenches opposite us, as they had been doing to the south. Our own plans for an offensive were nipped in the bud by this untimely retreat of the Boche. It came earlier than was anticipated by the British Staff. For our part we had nearly finished the construction of a large number of dugouts close up which were to be used as

assembly shelters for large attacking forces. On March 18 they evacuated the trenches at Beaurains, a village in the enemy lines across from us at Achicourt. Evidently they had abandoned these lines on the night of the 17th. On the morning of the 18th our infantry reported that there were no Germans in the trenches opposite.

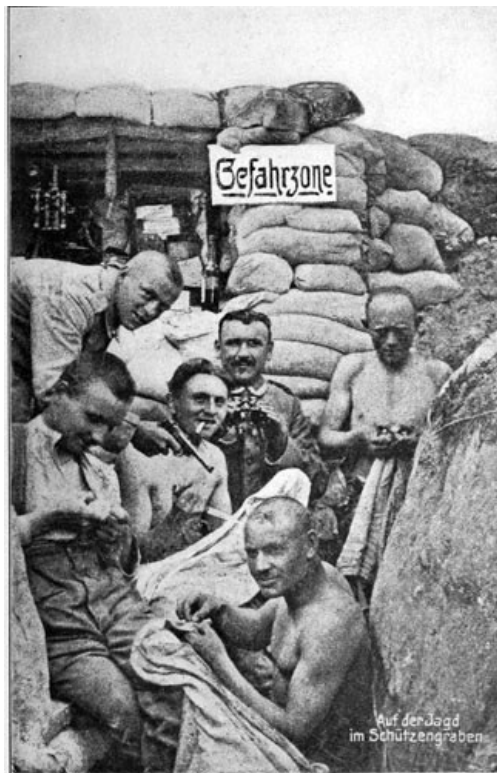
In the afternoon another man and I crossed over to Beaurains to investigate any dugouts which might have been left there. We only found two or three which had not been destroyed. These were all very deep and were strengthened at the entrance from the trench with heavily reinforced concrete and in most cases there was a concrete wall also on the parados side of the trench opposite the entrance. As they were shelling the village heavily with eight-inch shells as they retreated, we did not tarry longer than necessary. The next day we went across again and followed up the retreating Huns until we came within rifle-range. Our infantry had pursued them as hard as they could, but they were considerably handicapped on account of the fact that no supplies except what they could carry in their packs could be brought forward. The infantry had a hard time. The destruction of the road made it impossible for them to use their transport. It was very difficult for them to carry up sufficient rifle and machine-gun ammunition, much less adequate rations and water. I saw many poor chaps drinking from the muddy shell-holes, and they lived for several days on much-reduced "iron rations." Everywhere along the area of their retreat the Germans had blown big craters in the roads, craters from 30 to 100 feet deep and from 50 to 200 feet wide. These were blown at all crossroads, and in addition, at every quarter-of-a-mile interval on the roads. Their work of destruction everywhere was most thorough. All buildings and walls had been destroyed. Those alongside roads were felled across the latter—anything to tie up traffic. We seldom found a wall left which was over three feet in height.

Cellars, dugouts, and shelters of any description were obliterated or their entrances had been closed by firing charges of high explosives. The dugouts and ruins in many places were still on fire or smouldering. All trees were sawn off within a foot to eighteen inches of their base, this work having evidently been done with small gasoline saws. Large trees were everywhere felled and left lying squarely across the roads. All wells were either blown up or had been poisoned by chemicals. The latter course must have involved the use of very large quantities of chemicals. The work assigned to us later was to unearth and withdraw all mines left in dugout entrances and elsewhere, and pick up all bomb-traps and devilish contrivances of a similar nature.

This kept us very busy. Thousands of these had been laid. All railroads were undermined; the first train going over near us at Achiet-le-Grand was destroyed. Contact-mines were left under the roads in many places, especially at crossroads, and these would be fired when any heavy vehicle or gun crossed them. In other places they had placed mines with delay-action fuses. A large brigade dugout headquarters near us at B. went up in smoke about ten days after being occupied. Most of the dugout mines were placed about half-way down the entrances on the right or left side, and these had been tamped with sand-bags, detonators connected with leads which were fastened to the wooden steps, and these would be fired as men walked down. It required a careful eye to detect them. We would notice some slight change in the timber at these places and invariably carefully withdraw this and the sand-bag tamping and take out the detonators and the high explosives. Running short of high explosives, the Germans often threw in bombs, trench-mortars, etc., to add to the charges.

Numerous bombs which a touch would fire were found everywhere. In the barbed wire on top of the trenches we would find the German hairbrush bombs tied by their fuses to the wire, with the latter looped in a half circle so that as a soldier walked along he would catch his foot in the loop and fire the bomb. In the trenches we found thousands of the German egg-bombs connected to and underneath the duckboards or trench boards laid on the floor of all their trenches.

These would be fired by any one stepping on the duckboard, and as there was no other place to step in the trench, it was a case of Hobson's choice. It afforded us much amusement to explode these by throwing bricks on them from behind cover.



In a German trench.

This picture was found by Captain Trounce in a trench which was captured by the British.

In such dugouts as were left we would find attractive souvenirs hung up; to most of these bombs would be attached. Some poor chap would see a good-looking German helmet hung on a nail in the dugout, attempt to remove it, and fire the bomb attached. We decided to go pretty carefully and gingerly about this work and were lucky enough to get through with only ten casualties in our company. After a few days it was not necessary to caution any troops about these little devices which the Boches had provided for us. They would hardly dare step on a stick or twig for fear it was connected to a bomb. We found the German trenches everywhere were honeycombed with subterranean galleries. The majority of these tunnels were from twenty to forty feet in depth, and close-timbered with hard wood, usually four-inch oak. Mile after mile of galleries, usually six feet by four in size, were found, and all were of first-class construction, with the timbers well braced and wedged. It was a constant source of wonder to us as to where they obtained this vast amount of lumber and how the Huns had been able to get it up in such quantities.

I was detailed one day to make a search with a small party for a cavern which existed in the village of Mercatel. I took over the men and we searched very thoroughly throughout the village. Although the cavern undoubtedly existed it was impossible to find any entrance; not only that, but every cellar, dugout, or shelter of any description in Mercatel had been likewise very systematically blown in. At one crossroads in this village, the enemy had blown a crater some sixty feet wide, and it had been necessary to build a road of broken brick through some ruins to make a turnout for the constant traffic. This work was continually shelled by the Huns, and furnishes an illustration of some of the difficulties the engineers encountered at every similar crater blown in the roads in this advance. All the troops possible who could be assigned to building roads were so detailed, but the magnitude of the repairs naturally slowed up our pursuit of the enemy. In the pursuit of the Hun, the light artillery was sent up as quickly as possible; on account of the frightful condition of the roads, it was impossible at first to use the tractors for the heavy guns. The weather was very bad, almost continual rain. The loss of horses was appalling. I understand that 200,000 of these poor animals succumbed to the effects of the hard weather, exposure, heavy work, and shortage of feed. At the side of all roads you would see dozens of horses lying dead, stretched in the mud. Once they fell in the mud, it was next to impossible to get them on their feet again. Among the mules, however, there was little loss. One would see 50 dead horses to 1 dead mule. It was a pitiful sight. Nearly all of the lighter guns and howitzers were taken up with 3 teams of horses, while the heavier guns were brought up after much delay by the usual Holt Caterpillars when the roads were repaired sufficiently to bear the traffic.

We captured thousands of prisoners in the retreat. Almost every day big batches would be brought in and placed in the barbed-wire prisoners' cages of every division on this front. Dazed, dirty-looking specimens for the most part they were, too. Men of all ages were included, from schoolboys to men of apparently nearly fifty years of age. In almost every instance they had been subjected to intense bombardment for several hours or days, and they certainly showed the effects, being in a sloppy, dishevelled condition. A few of them could speak English, but, being very carefully guarded, it was next to impossible to talk to them.

A few were apparently sullen, but the majority looked as if they were pretty well pleased with themselves and realized the war was over for them at any rate. The little German prisoners

seemed to be all tin hat and boots. They wore the clumsy boots which we associate with farmers. The wounded were always given first-aid treatment and our men would give them cans of "bully beef," biscuits, and cigarettes, and these were accepted with every evidence of appreciation. After spending a few hours in the prisoners' cages, which were usually placed two to three miles back of the front lines, they would be marched to more permanent camps beyond shell-range, and from the latter would be taken out daily to work on the roads, railroads, etc., under charge of their own N.C.O.'s and an occasional British Tommy. Thousands of these German prisoners are to be seen all over France.

Shortly after the beginning of the retreat of Arras, we were billeted in the village of Blairville, a short distance south. Here we occupied an old ruin, which had evidently been the quarters of some German officers before we arrived. From the cellars of this house we could walk back to their old front-line trenches in underground galleries for over half a mile without once coming on top. In fact, one could go through the entire village underground in this way. The day after our arrival I noticed a French woman coming out of a garden near by. She was carrying something in a yellow scarf and looking very pleased with herself. In answer to my inquiry, she informed me that she had just dug up from her old garden the savings of a lifetime—several thousand francs. The Boche had occupied the village for nearly three years, but had failed to unearth her little fortune. Many old residents had adopted the same means of secreting their money and recovered it after the German retreat.

The relief of the French civilians at the retreating Hun was very marked. As one French girl rather curiously expressed it to me: "Boche partir finish wind up now." Everywhere possible they started to rebuild their roofs and walls, and emerged from their partial cellar life with great satisfaction.

CHAPTER XI

THE BATTLE OF ARRAS

ABOUT three weeks after the enemy had retired on our front opposite Beaurains a series of operations started which were afterward known as the battle of Arras. These were practically started with the splendid capture of the Vimy Ridge by the Canadians. All our fellows were highly delighted at this event, mainly by reason of the fact that we had served there for three months in the previous spring, and could appreciate the extraordinary difficulty of the task of the Canadians in capturing it, especially La Folie Farm. These positions were captured on April 9. Many other villages to the north and south of Arras were captured on following days. It was reported that the First and Third Armies took over 13,000 prisoners in the first few days of this offensive.

Unfortunately, on the 12th of April the inevitable bad weather ensued, and this considerably handicapped our efforts everywhere in this vicinity. The tanks were again much in evidence, being used in hundreds. They were brought up at night along the sunken roads and behind ridges, camouflaged very ingeniously, and then used at dawn the following mornings in attacking with the infantry.

Two types of tanks were used by the British, male and female, the female being the smaller variety. The male tank was equipped with six Lewis automatic rifles and two 6-pounders, the latter firing armor-piercing shells, while the smaller tanks were provided with Lewis guns only. I noticed one of the female tanks was equipped with 6-cylinder silent Knight engines and developed approximately 120 H.P. It had 12 inches of clearance above the ground and was about 8 feet high by about 12 feet wide in the centre, and 25 feet long. The male tanks were larger and heavier, some of these being, I think, more than 45 tons in weight. Afterward in conversation with one of the tank commanders he informed me that they had struck Boche barbed-wire entanglements that day over 10 feet in height and extremely thick. All the tanks have pet names given them by their crews.

The bombardment preceding these daily attacks was very intense, more so even than those of the Somme operations. It was a very interesting spectacle both by day and night. Close up one could hear the continuous roar from the guns and at night the flashes would light up the sky all around. Most of the batteries were set up on the sides of roads. In the retreat and the fast succeeding offensive there had been neither time nor opportunity for the gunners to construct their usual emplacements. It was appalling to consider the cost of some of these bombardments. As an example, the 9.2-inch howitzer shells, thousands of which were fired weekly by each battery, cost about \$150 apiece.

In many of the daylight attacks the assaulting infantry would wear small tin plates on their backs. These would flash in the sunlight and enable the gunners to keep them in sight as they advanced over the ridges while they maintained an effective barrage ahead. Many difficulties were encountered in bringing up guns, ammunition, and supplies. On account of the state of the roads, which for a long time were almost impassable, the traffic had to be handled with much judgment and care. One-way traffic routes were established in many places, and military police, usually from cavalry units, were posted by the road control officers at all crossroads. Tie-ups frequently occurred, often resulting in a line of traffic a quarter to half a mile long being held up. The Boche airmen promptly took advantage of this situation by flying over and dropping bombs on us. While we were on road-work it was our business to keep the trucks and wagons steadily moving along. Whenever a truck was ditched we made every one climb down and get behind the wheels and move it off into a field out of the way, or get it out onto the road again.

Since the retreat had started we had been living half the time on our "iron rations," the latter consisting of bully-beef (corned beef), hard biscuits, small cubes of Oxo, with tea and sugar. The tea and sugar were usually carried up in a sand-bag, and when boiled formed a curious concoction which tasted strongly of sand-bag.

The open warfare which developed in this retreat was welcomed by all ranks, and their increased cheerfulness and rise of spirits were very marked. The enemy losses must have been extremely high. In every village, and alongside all roads, the bodies of German soldiers could be seen. I was in Neuville-Vitasse the day after it was captured and saw their dead lying in hundreds in the ditches, on the wire, and in the brick ruins. Ghastly sights they were too. The front line of the famous Hindenburg trenches ran through this village. As we walked into the village we noticed a broken German machine-gun left on a simple earth platform, in a shallow trench by the side of the road. It appeared that the man in charge of this gun had sold his life dearly, for fifty yards beyond some sixty of our poor fellows had been killed by its fire and were already buried there. The infantry were fighting hard at Chérisy, a short distance on our right, and many of their "walking cases" and "stretcher cases" (wounded) passed us going back to the nearest ambulance-station.

The fighting in the air was very active. Observation-balloons were up in large numbers. During this time I saw one of our planes bring down six enemy balloons in less than half an hour. The

airman's usual plan was to suddenly drop out of a cloud away above them and let fall a bomb on the hydrogen bags. These would at once burst into flames, and the observers would seldom have time to get into their parachutes.

It was a common practice when the Huns were shelling our balloons, which, by the way, afford a nice large target for shrapnel, for our observers to signal the crew on the winch-truck below to pull them down and then send up an empty balloon again for the Huns to shoot at. No doubt the same ruse is adopted on each side of No Man's Land, but I can vouch for the fact that much German powder was wasted in this way.

The work of the Canadian railway-construction engineers was very fine here. They rebuilt the old standard-gauge French lines which the Germans had destroyed and carried the new roads up to within a mile of the then front lines in the Hindenburg trenches. They were forced to rebuild many trestle-bridges, and their pile-driver crews carried on the work with great rapidity, calmness, and efficiency. The steam from their upright boilers provided an excellent target for Fritz and they were shelled consistently, but nevertheless the Canucks accomplished the work successfully. Twelve-inch naval guns were run up on this standard-gauge railroad and often fired from one to two miles back of the trenches. Previous to the retreat of 1917 it had evidently been more or less the policy of the British to rely mainly on their mechanical transport rather than on light railroads and standard-gauge railroads for transportation of supplies to the most advanced zones.

Since that time the general tendency has been to construct the light railroads almost up to the support-line, or to points within a mile or less behind the front trenches. The standard-gauge railroads also are now carried up much closer. On most sectors on the British fronts the light railways are now laid right up to the front line and supplies sent up on them at night. Previous to this time it was the exception rather than the rule to take them up so far. In this change they have more or less followed the example of the Boche engineers, whose light and standard-gauge roads are run up very close to their forward trenches.

The main difficulty in the constant use of large trucks or motor-vehicles was that the roads could not stand the constant and heavy wear on them. Adequate maintenance for the roads for the last two or three miles was out of the question, on account of the lack of men and material necessary for their repairs, to say nothing of constant hostile shelling. During the previous winters, road control had been established, and the most direct routes to the firing-trenches were often closed for weeks at a time, while all heavy traffic was routed along third-class roads, which were often double the distance of the more direct roads.

During the first week or two of this offensive we were employed on repairing the destroyed roads or building new ones. In many places where they crossed the old trenches we were obliged to take out the timber from the German trenches and dugouts, and corduroy the roads with it. Their lumber proved very useful. In many other instances we used the only material available—brick from the ruins of the buildings near by. These brick roads were naturally not much good, but they served our purpose for a week or two. We found considerable quantities of German high explosives in various dugouts. These we used in demolishing many of their own concrete emplacements, being able later to utilize the concrete so obtained in our work of road-repairing. The large trees which they had felled in such numbers across our path gave us much trouble.

The drainage was of first importance. With the exception of the main metalled or pavé roads, which invariably have ditches running along each side, the majority had no culverts of any description. It was very necessary for us to construct narrow drainage ditches along the sides and run these off into deep sumps dug in the adjoining fields from ten to twenty feet on either side of the road. This is practically the same method that we adopted in draining most of the communication-trenches. In the advance and the half-open warfare then proceeding, the infantry and gunners would carve little "funk-holes" or shelters under or into the banks of the roads, or use their waterproof sheets to cover the little huts they built with low walls of sand-bags filled with dirt.

On account of the Germans having destroyed practically all of their dugouts and shelters, there was little protection for us from their constant and heavy bombardment. Our only resource was to jump into the trenches which lined almost every road. As a matter of fact, trenches are fairly good protection and we were always glad to use them.

In addition to our rebuilding the highways we were engaged in making a reconnaissance of all the captured district in this area, and perfecting plans for the thorough salvaging of all enemy material left behind. The amount and value of this was very great and included rails, timber, iron, ammunition, explosives, and many other useful things. A light railway was constructed for several miles in the old No Man's Land and millions of dollars' worth of material recovered, even including the iron knife-rests for supporting barbed wire.

We used very large quantities of the old German dugout timber in constructing new dugouts in our recently captured positions.

It was common practice by this time to start the construction of new deep-mined dugouts if the trenches were occupied a week only. In the past the British were always optimistic about capturing the other fellows' trenches before long and had contented themselves with very frail, easily built shelters. As a natural result the casualties had been enormous.

It was not surprising to us that the morale of the German troops should be so inferior to ours. The fact that they practically lived underground most of the time, and even when on duty in the trenches above usually occupied one of their heavily reinforced concrete or thick steel-plated "pill-boxes," readily explained their rooted objection to facing the music on top. When our sentries were on duty they had practically no protection except, perhaps, the very occasional use of a sort of steel breastplate and always a sharp pair of eyes.

The German emplacements or strong points, often referred to as "pill-boxes," were built in the most solid manner. The reinforcing of the concrete was usually accomplished with the use of round steel bars, rails, and I-beams placed at very close intervals in a rich mixture of concrete, while the foundations were deep and also well constructed.

Many of the steel-plate emplacements were used. These were usually constructed of steel plates two or more inches thick, bolted together and embedded in a concrete foundation. As in the case of the concrete strong points, they would nearly always withstand direct hits from shells of average caliber. We found many "pill-boxes," with three-inch shells sticking out of the steel reinforcing rods.

We were camped under canvas for several weeks at the village of Boyelles, about two miles back. Within a hundred yards of us was placed a large ammunition-dump, including many gas-shells. No cover for them could be obtained, so the shells were merely placed on the ground and covered with tarpaulins. Every night we were strafed hard at this camp, but, luckily, the dump was not hit. One night, we were quietly playing cards in our camp when a Taube dropped five bombs in quick succession within twenty yards of our tents, killing four horses and two men. This bomb-dropping was then, as now, a common occurrence behind the lines.

The work of the ambulance men and drivers during these days was splendid. On May 3 another man and I were watching with our glasses from an assembly-trench very near the shelling of an aid-post with Boche eight-inch shells. This post was in a dugout off the side of the road and the Huns were placing nearly every one of these heavy shells squarely on top of it or on the middle of the road. During the thick of this terrific bombardment we saw several Ford ambulance drivers bring their cars up, load their cases, and drive calmly away again.

The next day one of the infantry officers on our front who was scheduled to lead an attack "over the top" got started through some miscalculation five minutes before the appointed zero hour. The whole of his party ran into our own barrage and were nearly all blotted out. The same officer survived—but reached a dressing-station near us quite out of his mind.

Up the road a short distance from our camp was an infantry company officers' dugout, with another near them occupied by their orderlies. One night in May a Boche eight-inch shell burst on top of the orderlies' dugout and buried them completely. Unfortunately, the fact was not discovered until daylight, and when the entrance was cleaned out again the men had been dead for some time. So many were buried by shell explosions in this way that all dugouts are now constructed with two or more entrances.

CHAPTER XII

THE HINDENBURG LINE

ON May 20 we engineered a most successful underground operation, and very materially aided our infantry in capturing another 500 yards of the famous Hindenburg line. In order to understand the situation more clearly, I will endeavor to explain briefly the construction of these Hindenburg-line trenches. They had undoubtedly been constructed during the months previous to the German retreat and were cleverly planned and executed. It was apparent that the enemy had intended to retreat to them and to hold them at any cost, and their subsequent capture by the British must have occasioned the Boche General Staff considerable surprise and pain. It was evident that the Germans last year, instead of constructing armored tanks to oppose ours, had decided to build large, deep trenches which they hoped would prove in most cases an insurmountable obstacle to the British tanks. The tanks could not normally cross a very wide trench, but the terrific artillery bombardment of the British succeeded in levelling off the trenches so that a tank commander by careful observation would be able to spot places at intervals over which he could waddle his machine. The usual three lines—reserve, support, and front—had been built, very heavy, wide, and dense barbed-wire obstacles separating them. All of these trenches were approximately twelve to fourteen feet deep and fourteen feet wide at the top. Opening from the sides at about fifty yards' intervals were dugout entrances built at an angle of forty-five degrees to the surface.

These entrances all opened out at the bottom into a uniform gallery six feet by four in size. The galleries ran underground for miles; one could go down an entrance in one village and come up again ten or more miles away in another. Everywhere there was an overhead cover of hard chalk and clay of from thirty to forty feet. As happens in nearly all of the Boche underground work, the tunnels and dugouts were all built of four-inch oak case sets, closely timbered throughout. On both sides of the tunnel at frequent intervals small chambers were cut out for the use of officers, non-coms., and cooks. In the main galleries the sides were lined with double bunks, in size six feet by two, made roughly of two-by-four lumber with chicken wire nailed across for the men to sleep on.

As these bunks took up about two feet of the four-foot width of gallery, it must have made it very difficult for the stretcher-bearers to move the wounded out. The enemy incidentally had very accurate surveys of these trenches and could always be relied on to place their shells squarely on or in these captured trenches.

Their former German garrisons had done themselves very well, and many evidences of comfort were found which are absent from our own trenches.



View from rear of a typical German reinforced concrete machine-gun emplacement. Taken on the Hindenburg line south of Arras.

Although the trench itself was blown to pieces by British artillery fire and the machine-gun crew either killed or captured, no harm was done to the concrete emplacement.

At intervals of approximately 100 yards the Germans had built reinforced concrete emplacements, with usually the top of the emplacement, or pill-box, from a foot to 18 inches above the surface of the surrounding ground. These well-nigh impregnable positions were all very ingeniously camouflaged, and could not be detected by the sharpest eyes from the direction of our trenches until one was almost on top of them; and even then the only thing to be seen were one or two firing loopholes. The illustration shown here was from a photograph taken in the Hindenburg line from behind the "pill-box," where, of course, no screening was necessary.

It will be readily seen that this emplacement had not been damaged much; in fact, it was practically intact, only small pieces of concrete having been chipped off by our shells. The trench itself had been almost obliterated by our artillery-fire, and the sides so destroyed that it was possible for a tank to cross. The emplacements in the Hindenburg line, as elsewhere, were variously used as machine-gun posts, observation-posts, trench-mortar positions, snipers' posts, etc. The British referred to this type of concrete pill-box as a "Mebus." It was a matter of considerable difficulty to destroy them from above by artillery-fire, and even if our gunners made a direct hit with a heavy shell it was seldom put out of business.

About a week before the time I have referred to we were informed that two infantry assaults had come "unstuck" and the parties composing them nearly all "scuppered" by reason of the heavy and accurate fire coming from a double machine-gun concrete emplacement some 200 feet in front of our most advanced barricade in the Hindenburg trench opposite the village of Fontaines-Croisilles. The artillery had endeavored several times to destroy this position, but were not successful. It became necessary to remove it.

The division staff then inquired of our company commander as to whether we could do anything from below. He thought we could and my section was detailed for the job. My company commander, Captain Miller, incidentally one of the finest sportsmen I ever wish to meet, was delighted with the opportunity.

The subsoil here was a hard chalk, and the top-soil a sandy clay, the latter averaging from seven to ten feet in thickness. It was essential to the success of our scheme that we confine our underground tunnel to the clay, it being possible to excavate in the clay almost without noise, while in the chalk below this could not be done.

Starting from an old dugout entrance we constructed a tunnel approximately four by two feet for some distance, and from this point to our objective continued a "rabbit-hole" three feet by two in size. As we had only an average of two feet of clay above our gallery we were considerably bothered by our own shells landing near, and on one occasion they destroyed it with an eighteen-pounder. At other times we broke through into shell-craters on our way over. One night after a heavy rain I was on duty in the tunnel when we were pretty close to the German pill-box and their crew. The earth sloughed away from the top of the gallery and exposed the timber of our gallery-sets. We blew out the candles at once and very carefully placed some muddy sand-bags over the exposed portion. Being so near the Boche sentries, we were fearful that they would have spotted our light, heard our low whispering, or even our heavy breathing.

The next night we struck the concrete of the emplacement, and very carefully excavating down to the bottom of the clay against the position, we placed a charge of some 500 pounds of high explosive, carefully inserted the usual detonators and electric leads tamped the gallery for some 30 feet back in the tunnel, and the next dawn at the "zero" hour fired the charge the instant the infantry went over the top.

The resulting explosion very satisfactorily disposed of the troublesome "Mebus" and largely enabled the 4th King's Liverpool Regiment to capture some 200 yards of the trenches. Some 12 hours later the 2d Argyll and Sutherland Highlanders continued the attack and captured an additional 300 yards, as far forward as the River Sensée (at this time a dried-up stream). In addition to a large number of Germans killed, they captured many wounded and over 60 unwounded prisoners that day, the latter caught in the underground tunnels completely by surprise. Early the next morning the Germans attempted a counter-attack in force, but the assembly having been observed by the F.O.O.'s, the gunners promptly and efficiently broke up the party.

I noticed the next day that smoke was issuing from a number of the tunnel entrances in the area captured, and other entrances were badly burned. In conversation with one of the Scotch officers it developed that the Jocks invited the Huns to come up out of the dugouts only once with their hands up to surrender. If they failed to respond promptly, bombs would be thrown down into the tunnels to expedite matters. This officer complained that he had posted sentries to guard the prisoners at each dugout entrance, but that as soon as his back was turned some trouble would occur, which necessitated more bombing practice on the part of the Scotch sentry. This was only a small affair, a battalion stunt. Everywhere along this front each day some attacks would take place, perhaps a regimental or brigade attack, or at other times just a small company raid.

For a day or two after this attack our trenches here were filled with the bodies of Germans and British. H.E. and bombs are terrible things.

It's all too big for words! I can only describe some of the incidents I saw or was connected with. These are typical of what was constantly occurring, and this was happening everywhere in our vicinity. The bodies and even uniforms were almost torn to pieces. Below in the dugouts were the German dead and wounded, the dead in every conceivable position, lying sprawled across the

steps of the dugout entrances, half hanging from the dugout bunks, or on the floors of the tunnel. The wounded had been given first-aid treatment, and our soldiers were giving them a share of their rations and cigarettes. Some of our men were searching around for German souvenirs, the invariable practice after the first excitement of an attack is over. I tried to talk to some wounded Germans, but couldn't get very far with the conversation, then left them some cigarettes and passed on. We found many things of value. The Boches had set up an electrical listening-instrument in the chalk from the tunnel below, but had apparently, unfortunately for themselves, neglected to listen to our underground work in the clay above.

Attacks were made almost daily on this front. A week or so before the attack just described, a party of the Leicester Regiment had suffered badly. A party of some 200 wounded infantry, including, I believe, some other units, had been captured by the Huns and placed for the time being in a German barbed-wire prisoners' cage in the village of Fontaine-les-Croisilles. This village was a popular target with our artillery, and soon after these British soldiers had been placed in the cage it was shelled badly by the English gunners.

The account comes from a wounded corporal whom we helped to haul in over the parapet one night. He stated that during the bombardment the Hun sentries bolted and all these prisoners who could walk or crawl escaped, a few of them, including himself, managing to reach No Man's Land and at night our own trenches. Although a prisoner for only a short time, his account of the treatment accorded them confirms all of the stories of the brutality inherent in the German race. No treatment was given to the wounded, not even first-aid. No water or food of any kind was allowed them, and whenever a German guard noticed a prisoner looking up or around, he was struck over the head.

The same night a sergeant of the same battalion crawled back over our parapet after having spent four days in No Man's Land with a broken arm. The poor chap had been bombed, and sniped at as he crawled painfully back, and machine-guns all along the line had opened fire on him. No one was to blame; all sentries have explicit instructions to fire at anything moving in No Man's Land. It was a marvel he even reached our parapet, but he told us there were other poor fellows out there still alive. Rescue-parties were instantly organized and brought in all the poor chaps they could find.

One of our own tanks had broken down in a previous attack and was now lying in a shallow sunken road about twenty yards from our most advanced position. The caterpillar tread of this machine had broken, and it was then occupied by an infantry detail, the former tank crew having gone back to man another tank. From this machine we could get good observation of the enemy trenches. To get to it in daytime we had to double across the road and get inside in a hurry.

It is an unfortunate fact that many of our men were wounded from our own shelling in these Hindenburg trenches. When a programme "strafe" by our heavy guns and howitzers was planned on the nearest enemy trenches, it was the practice to withdraw the infantry and engineer parties who were on duty or working in our most advanced trenches. With the ever-increasing destructive radius of our heavy H.E. shells it was impossible to avoid a certain percentage of casualties of this nature. Occasionally also other shells would burst short. I was standing by the side of a sentry one day when his arm was broken by a shell fragment, and every one can record instances of close shaves from them.

With the bulk of the German troops opposite us in deep dugouts most of their time, it was an increasing problem with the gunners to secure targets. I was observing one day with an F.O.O. when we spotted a couple of Boches running across from one trench to another. He promptly called to his telephonist to order three guns of Battery No. — (three-inch) to open fire on them. At the same time he remarked: "We're doing lots of sniping with our eighteen-pounders these days."

One day about this time I was walking back to the village of Hénin with my section commander when a staff limousine pulled up on the road and a staff captain and half a dozen correspondents stepped out. The staff captain inquired as to whether there were any of the new heavy howitzer batteries near us and, if so, could we recommend them as being reasonably safe. The correspondents wished to see some in action. As it happened, there was a 9.2-inch battery quite close and we introduced these gentlemen to the gunner major in charge of the battery. Mr. Hilaire Belloc was pointed out to me as one of the party. I understand the latter gentleman walked on to the first Hindenburg line shortly after.

Our main company camp at this time was at Bois-leau-St.-Mare, some three to four miles back. We could usually figure here on being out of the war, as we expressed it. Nevertheless, one day when we were at lunch in one of the Nissen huts, of corrugated-iron construction, the Huns were shelling an observation-balloon near us. Numerous fragments struck the hut. Some of us decided to lunch in our tin hats. One of the mess-waiters was severely wounded in the head at the same time. The shelling of camps at this distance was rather exceptional, though, and only occurred at intervals.

My furlough coming due toward the end of May, I applied to the brigade commander for leave to visit Paris. The request was not granted, apparently on account of the fact that too many officers were applying. Instead of going to Paris, I crossed over to London for the ten days' "permission."

Whilst in London and some two days before I left to return to the trenches in France, General Pershing and his staff arrived in Liverpool and came on down to London. Since our declaration of

war I had been trying very persistently to transfer to our own army, but had not had much success. General Pershing and his officers were stopping at the Savoy Hotel. I immediately called on some of the engineer officers, being delighted to see and talk to some real American men again after such a long time. The officers were much interested and did their best to straighten matters out so that I could be at once transferred. Unfortunately, there was some red tape to untangle, and finally I was advised to hand in my written resignation as a British officer and ask the British authorities to accept it on the grounds that I wished to join my own army, and thought my experience would be of value in training our men. Accordingly I mailed my resignation from London to my commanding officer and returned to the trenches.

On my return to the Cambrai sector I found my section were engaged in salvaging enemy timber and other material from the old German lines near us. After a short time at this work I was ordered to take command of another of our company sections who were at that time building new dugouts near the Hindenburg trenches close to Bullecourt. There had been a recent mining alarm there, but our fellows had, as I was informed, satisfactorily disposed of it. In the course of a few days I received a "chit" (note) from the brigade major of the infantry occupying the sector, stating that "suspicious noises believed to be enemy mining" had been reported from a Lewis-gun party who were occupying a "Mebus" (old German pill-box) at the end of Lump Lane, the latter a forward trench which served as a communication between two firing-trenches. Accompanied by an experienced miner I visited the "Mebus" and we both listened for some time. We heard the enemy working, but could get nothing satisfactory from this spot. A short distance from the "Mebus" in No Man's Land we found an old dugout entrance which had been half filled in with loose earth. We carefully crawled down this and listened. Very soon we heard the Germans talking and walking past in the gallery below us, going past us and in the direction of the "Mebus." One man would go down while the other remained on top in order to cover against surprise. Every time we moved whilst listening in this entrance a shower of dirt would slip and run down the sides of the gallery, making considerable noise. This was not pleasant, as we expected the Huns to hear it. We reported the situation to the infantry and advised their withdrawing their post from the end of Lump Lane. In addition to the Lewis-gun post there was a bombers' post of four to six men within twenty yards of the former. The infantry company commander was very loath to act on our advice, particularly as the "Mebus" was an admirable observation-post.

The next day the divisional commander visited this sector of his front and, hearing of the suspected mining, ordered me to report to him. At the battalion dugout I repeated to him the advice I had given the company commander, with the result that he promptly instructed the latter officer to withdraw the posts referred to.

In order to play safe, we at once started to counter-mine from trenches a little farther back. A few days later the Huns fired a mine almost directly under the "Mebus." The infantry occupying the former post would most certainly have been all killed.

It was quite evident that, although the trenches above had been captured from the Boche, below ground the old tunnels had not been destroyed at this place. Usually, as the Huns retired in the Hindenburg line, they destroyed the galleries below as well as barricading the trenches on top.

Our work in the Hindenburg trenches was most interesting. Relics of the former inhabitants were around everywhere, buried or half buried in the trench above and lying around in the galleries below. Uniforms, equipment, bombs, ammunition, even black bread and sausage, cigars, beer, and numerous other things were found. The work of cleaning them out was a big task. All dugouts have a peculiar "fug" of their own, but these German dugouts were particularly unpleasant. The work of repairing the tunnels and rebuilding these parts which they had destroyed was given to us. Most of my company were split into small parties, and our work extended for several miles along this front. Some six or eight of our men would be detailed to dugouts or other work, and each of these parties would have usually from fifteen to twenty infantrymen to assist them.

At this time the Australians were having some very heavy fighting at Bullecourt. The enemy had made over twelve counter-attacks in attempting to recover the positions lost. The roads through Croisilles and up to the trenches were badly shelled. The alertness of the military police stationed at crossroads certainly saved many casualties. The familiar "shelling up the road, sir," often prevented our running into bad spots. We would wait for a short while and then go on.

Our men, instead of marching up the roads in artillery formation, would in the daytime hike across the fields in groups of two or three, usually trying to avoid battery positions. This undoubtedly reduced our casualties. We gave them always a contract task to do, such as placing three or four sets of timber, excavating the necessary dirt and camouflaging the latter.

After long experience we found this method the most satisfactory. When their work had been passed by the shift non-com., they could go out to their camp. These section camps were approximately from a mile to a mile and a half back of the trenches. For a time whilst in the Bullecourt trenches we occupied dugouts in a chalk quarry in the support-line. When things were fairly quiet we would ride right up to this point on our motorcycles. These chalk dugouts were also the regimental headquarters and first-aid post. In a cubbyhole opposite ours in these quarters I met one of the most genial M.O.'s (medical officers) I ever knew. His good humor was infectious and his light, cheery badinage to his patients of the utmost value. On the 18th of July, after having been up on our two days' shift, I said good-bye to this officer, thinking I would be

back again in another forty-eight hours. On my arrival at the section-camp I was greeted with the news that my resignation had been accepted and that my name had appeared in the official paper, the *London Gazette* with the following announcement: "Temp. Lieut. H. D. Trounce relinquished his commission and is granted the honorary rank of second lieut., Royal Engineers—July 15th."

I had been serving in the trenches as a civilian since the 15th of July. As a matter of fact, I left the quarry at the right time. On July 19th the Huns were shelling them with 250-mm. shells. Most of them burst on top, each making craters about 30 feet wide and about 15 feet deep, though one with a defective fuse did not burst, but penetrated through some 18 feet of hard chalk to our dugouts and buried itself 15 feet below the floor about 10 feet away from our bunk. Fortunately it did not burst there, though 4 or 5 men were killed by the timber it smashed as it came through. The total penetration was over 40 feet.

CONCLUSION

My experience has been in no way unique; thousands of other men have gone through and are now experiencing much greater risks and hardships than any I have so far encountered. Fortunate men like myself live to write or talk of them, but in doing so feel almost contemptible to themselves when they compare their lot with those of the men who have given their lives and their all in the great sacrifice for the cause of humanity. However, we have taken our chance and now we are only too glad of an opportunity to tell of the bravery and cheerfulness of our comrades in the trenches. In my account I have related a number of characteristic incidents which came within my own observation, or which happened on our small front. Thousands of such incidents are happening every day all along the line and are a part of the every-day life.

On my return to the United States I returned to California for a short vacation and the rest I badly needed. In October, 1917, I received a commission as a captain in the Engineer Reserve Corps, and reported again for duty, and I now am expecting that I will be shortly ordered overseas again.

When I return this time it will not be for love of adventure, curiosity, or any such reason, only the same sense of duty which impels most of us to the task. Although there is undoubtedly a certain fascination which admits of no reasonable explanation in living in and going up to the trenches, I have never yet met a man who has spent a *long* period there who can truthfully tell me he really likes it.

Our great army is still new to us, but, nevertheless, I believe it is the duty of every person with a fair sense of justice, to learn to distinguish between the various aims of the service. The infantryman is the man who undergoes most of the dangers and risks, the real fighting man, and the man too who experiences the greatest hardships and discomforts. Find out if you can where a man has served, whether it was in the trenches or in a more or less comfortable billet in a village far from the lines and appreciate him accordingly. When successful actions occur in which the infantry, as usual, are the main heroes, don't forget the work of the engineer which made much of the success possible. A lady said to me recently: "Why, the engineers are in no danger, they don't go into the trenches, do they?" I hope that my account of an engineer's life at the front will do something to dismiss such ideas.

Every man and woman who plays his or her full part in this great struggle is justly accorded honor, and the greater the sacrifice the greater the honor.

I would not depreciate for a minute the value to the country of those men in the rear of the lines who are a necessary and vital part of the machinery of war, but I am jealous for the men who suffer most and endure almost unbearable hardships in the real trenches.

No officer who has served in this campaign has anything but the most unstinted praise for the men in the ranks—the real workers and the real fighting men. Many of us have felt at times that we were hardly fit to even tie their shoe-laces, such examples of cheerfulness and courage did they set us, and such inspiration did they afford us with their never-tiring devotion. Thoughts of this nature occurred to me last year when we buried one of our own lads just behind the lines, and paid him the last and only salute that an enlisted man receives. But his memory will never die!

CHAPTER XIII

THE PSYCHOLOGY OF FEAR

FROM a prolonged and varied experience under shell-fire, machine-gun, rifle, trench-mortar fire, etc., and from an intimate and close association with men of all kinds in times of deadly peril, it seems evident to me that personal courage is very largely a matter of physical condition and general health, and that, provided a man be healthy and his nerves in good condition, it is natural for him to be brave.

In the case of a man of liberal education, used to the refinements of life, imagination is an important factor of personal bravery, and I think it would not be incorrect to say that sixty per cent of his courage is dependent upon the possession of good health, and the remaining forty per cent representing strong control of will and nerves.

He who is less educated, less sensitive, or whose nerves are less highly strung, relies to a greater extent on his physical condition, and the element of imagination is naturally less, representing, one might say, for purposes of comparison, eighty per cent physical condition and twenty per cent mental. The imagination of such a one, as a rule, does not carry him to the same lengths as does that of an educated man, and his envisage, as it might be termed, is only concerned with the actual events happening in the immediate vicinity, while his mind quite philosophically reviews, or more often fails to consider, the possible dangers ahead of him. The mind of the man of intelligence is so much more active, sees so much further, and his observation and experience so plainly tell him certain possible and eventual consequences, that it is only by the exercise of very strong will-power that he succeeds in subduing the apprehensions into which his superior mentality carries him and in rising above them.

As a matter of actual fact, every one, educated and uneducated alike in different degree, experiences some distressing reflections on the eve of an attack, especially of an infantry attack. For the ten or fifteen minutes immediately preceding the "zero" hour, as it is called, or the second in which the men go "over the top" they usually have some leisure moments in which they are bound to reflect upon a possibly disastrous outcome. This period is particularly trying, but the average man is much more afraid of being thought afraid by his comrades than he is of the danger itself, and this feeling is necessarily greater in the minds of the more imaginative. Once he is started in the actual forward movement and has work to do, his mind is occupied nearly always to the complete exclusion of everything but the matter in hand; the excitement drives the emotion of natural fear from his mind; only in the lulls in the action is he conscious of any unpleasant moments, and it is just for such moments as these that our strenuous military training is largely intended. Weak men fail under the strain, and disasters ensue. But the long hours of drill and training have so instilled habits of self-control and obedience that this, combined with the inherent strong characters of men, the necessities of the moment, and their desire and determination to do their best, enable them to rise to heights never experienced at times less critical.

The above remarks refer to the sensations of the soldier about to enter upon an attack; every-day trench warfare is rather different. During quiet intervals, when the enemy are not raining missiles in his immediate vicinity, only his subconscious mind asserts itself, and the nervous strain, although existent, does not usually evidence itself in any outward form. However, when troops are being shelled badly, or, I should say, being "strafed," a worried and reflective look can be seen in the eyes of most men, which is usually accompanied by perspiration as a physical sign. Trench warfare has been very accurately defined as "months of intense boredom punctuated by moments of intense funk." This expression seems to cover the experience fairly well.

As a general thing, it is true that occupation of some kind which involves mental effort is nearly always effective in banishing thoughts of fear, and in times of extreme danger the most courageous of acts are performed when one is so absorbed in the endeavor to accomplish the purpose desired that the slightest thought is not given to the possibility of death, wounds, or sacrifice; and it is due to this absolute self-effacement that the most heroic deeds are done.

The unknown always presents the most fearsome aspect. A known and experienced danger invariably results in a much-increased confidence in one's will and powers of self-control.

The attitude of men in trench warfare is an illustration. For the first week or two they are "jumpy" and take very good care not to expose themselves needlessly; their imagination runs away with them to some extent, and they conjure up in their minds visions of themselves wounded, maimed, or even blown to pieces. Especially do these mind-pictures rise when they are alone in dangerous places. I remember that soon after I first went into the trenches, and, walking by myself at night (when it seems somehow that all dangers are accentuated) over a stretch of flat ground where no cover or shelter existed, and where, nightly, the enemy would pour a hail of machine-gun bullets over us. I remember well the very unpleasant sensations which raced through my mind, and of its dwelling particularly on the chance of my being hit and of being left badly wounded there on the ground for hours unnoticed, or until daylight came. I do not doubt

but that my mind, like others, was naturally influenced by some of the terrible things we had seen. One of the first sights that I happened upon in the very place to which I have just referred was a poor chap, a fellow engineer officer, who had been caught by a machine-gun fire, and who was lying dead in the path. How long he had been lying there I do not know.

Men are not usually alone in the front-line trenches, day or night, but occasionally this happens. I can recall very distinctly, in going my rounds visiting the different mine-shafts alone at night, of wondering, as I walked from fire-bay to fire-bay, separated by earth traverses or blocks, as to whether, as I cautiously made my way around, I would suddenly stumble on some Boche stealthily prowling there in the bay ahead or whether one would catch me from behind in the dark as I passed along. I was ready for them at any time, always carrying a couple of small bombs in my blouse pocket, but it's an eerie feeling that one has when patrolling sectors which are very close and often raided by the enemy at night. After many such experiences as these, men begin to form those habits of self-control which must characterize a good soldier.

But "revenons à nos moutons," as our French comrades say. After the first two or three weeks the average man acquires more confidence, and at this time the officers of his unit have to be especially careful in warning him against needless exposure. Then it is that he gets reckless, looks over the parapet every now and then, and in other ways shows an overconfidence which always results in an increase in the casualty lists.

A few months pass—a short time in an ordinary life, but a time so crowded with different sensations to the man in the trenches that it seems an eternity—he develops into a seasoned and confident soldier, and, while showing at all necessary times the strength and courage of the real fighting man in not fearing to make or face any attack, he meanwhile sensibly takes advantage of all possible cover available in the hope that he may not become a casualty before he has been of some real service to his country.

It is, of course, my conviction that, man for man, we are more than a match for our enemy; and when hand-to-hand fighting occurs, we can always rely on our fellows smashing the Hun. It is inspiring to me to see the confidence with which our new soldiers take their training: at first diffident, and later growing in confidence and assurance as they realize their ability to take care of themselves and punish the enemy. It has been my privilege to lecture to engineer officers and men, and I have felt to a marked degree the enthusiasm and conviction of superiority which is in the soul of every fighting man at our big camps.

What real man could fail to feel the grip of this war? Who would hesitate to show in a practical way the thoughts and ideals for which America stands? For is not *every one* called upon to do *his* share for humanity and freedom?

CHAPTER XIV

SOME PRINCIPLES OF MINING

MINING is an effective weapon, but it must be applied to suitable objectives, and its use restricted by certain rules which have been deduced from experience.

As regards the actual processes, the only important changes to be anticipated are the development of the use of rapid tools and of high explosives.

The most vulnerable points in trench-mine warfare are the following: Listening and observation posts in advance of the line; machine-gun and trench-mortar positions; junction-points of communicating-trenches with front line.

Mines were employed to attack, and countermines to defend, many besieged cities in the past, but the application of mining methods in trench warfare has at no time or place reached the scientific development which obtains in the present war, though our own Civil War furnishes several examples of its use in connection with the trench fighting of those days, viz.: Petersburg, Va., and other localities.

The situation of the western front is briefly as follows: Some thousands of mines have been blown by the Germans, British, and French, many of them with very large charges. The British and French were mostly engaged in defensive operations during 1915 and a portion of 1916, but since that date the application of mining methods by the Allies has been mostly on the offensive. Wherever opposing trenches are close together, mining warfare has almost invariably ensued. Mining fluctuates from time to time, and in 1915 and 1916 was most active on this front. It is always a possibility to be reckoned with, although the element of surprise, the most important factor in offensive mining operations, has now been largely discounted. On the other hand, the field of mining activity has been enlarged and is constantly changing. The destruction of enemy strong points is now an important problem for mining engineers. The use of mines in destroying roads and shelters also, in what might be described as the half-open warfare which has been so common this year, and in strategical retreats, is of increasing importance. The necessity of training engineer-pioneer units is important, as in the absence of special mining troops, this work may fall to their lot, particularly in the case of defensive operations in order to protect the infantry.

On account of the large number of men, quantity of material, expense, etc., the use of mining operations is very carefully considered beforehand, and careful plans devised before starting on any underground operations. Attacks are sometimes undertaken only to demolish a portion of the hostile trenches, in view of a local operation. At other times they form a part of a large offensive movement. Generally speaking, speed and silence are the first requisites. If these can be obtained with any degree of certainty, mining operations are nearly always successful. In the underground struggle in this war, the forces with superior personnel, material, and explosives at their disposal are bound to win, this is a fact proven by actual experience. The objectives will be usually such points as cannot be destroyed by artillery-fire, areas organized with deep dugouts and strong points which form valuable objectives, etc.

Almost everywhere on the western front the enemy are entrenched in deep, well-constructed trenches, and in nearly every area these trenches are further fortified by numerous deep dugouts and underground galleries, in most cases close-timbered with four-inch oak and other hard woods. The German mine systems are also almost invariably close-timbered.

In the same way as the general principles of tactics in open warfare agree with those of trench warfare, they are guided by the same logical reasoning. Many considerations must be studied before adopting any plan of offense.

With regard to depth below the surface, the miner must be guided by the elevation of his objective and by the nature of the strata through which he will have to work. In most operations the water-level is an important factor in considering depth.

It must be always borne in mind that mining is not an independent service, but is employed in connection with the other arms of the service.

Underground activity, either offensive or defensive, is first observed from those points in our lines nearest the enemy. All enemy trenches facing salients of our lines will be the object of particular attention and closest daily observation. This observation of the first-line and support-line trenches should disclose the presence of enemy underground works and their approximate location. For their definite location, the most careful listening underground must be done.

Aeroplane pictures are a source of much valuable information if studied very carefully. Aeroplane photographs covering several weeks, and if possible several months, are procured from the nearest squadron of the air service. The use of a strong magnifying glass will probably discover chalk mounds where fresh heaps are, by comparison with previous aeroplane photographs,

shown to be growing in size; and other features or changes which will afford useful information on careful study. Particular attention is paid to new trenches in the enemy's lines. In fact, any change from week to week in these aeroplane photographs is carefully accounted for. If further pictures are desired, particularly just after craters have been blown by the enemy or ourselves, they are furnished by the air service. The enemy's lines are studied from day to day with field-glasses. Perhaps the accumulation of sand-bags different in color to the others will be noticed, or freshly placed earth, white and less dull in color than that of the parapets, which have been washed by the rain and blackened by explosives. As a matter of fact, in mining operations in Flanders, where blue clay was encountered, the bags containing the clay (different in color to surface clay) were so distributed along the front-line trenches or breastworks on both the enemy and British trenches that it was a matter of considerable difficulty to obtain much information from this source. It was, of course, common knowledge that both sides were engaged in mining and fairly accurate information as to position of enemy galleries was deduced, but the actual location of enemy mine-shafts was very difficult to determine, as quite a number of mine-shafts emanate from dugouts and are connected up with others.

Listening reports give a fair idea of where the enemy's galleries are, and plans are made up showing the suspected location of enemy galleries or mine system. These plans are developed in accordance with the evidence furnished. Careful observation may show that a number of men come up the communication-trenches regularly to certain spots and there disappear from view. One may notice carrying parties coming up with timber, by catching sight of the timber above the trench. Infantry listening patrols, who have been listening in "No Man's Land" at night may have heard the sound of machinery or ventilators at work, or some other sounds which go to prove the existence of enemy mining, or the location of mine-shafts, etc. It is important to listen in "No Man's Land" at night, in order to obtain definite information or confirm the reports from infantry.

Sufficient evidence being obtained as to probable location of enemy mine-shafts, or dugout entrances, etc., there is difficulty in having these places "strafed" by our own trench-mortars and artillery.

In the desire to obtain evidence of the enemy's activity underground, the proper camouflage of one's own spoil-heaps and entrances cannot be neglected.

It is essential to have a scheme of attack. Numerous attacks have failed on account of there being no clearly thought-out plan. A common mistake has been failure to anticipate possible counter-mining by the enemy, and to commence the attack without guarding against it.

Study of the objective and the ground will therefore furnish the information necessary to settle the essential elements of the scheme.

The attacks must be arranged so as to reach the objective in spite of anything the enemy may do. The vulnerable parts are the flanks; that is, both the flanks of galleries or branch galleries which are first constructed, and also the flanks of the combined scheme.

Usually it is of no advantage to begin an offensive by mining if the enemy has covered his position with countermines; if the distance to be covered is more than 150 yards; or if the water-level is very shallow.

There should be more galleries than the actual number needed to reach the objective.

They should be placed close enough to each other to insure enemy operations being detected from either parallel gallery.

If the enemy tries to bar the way by counter-mining, a breach must be made in his system, so that, in spite of him, the galleries may be driven to their objectives and charges placed as previously arranged.

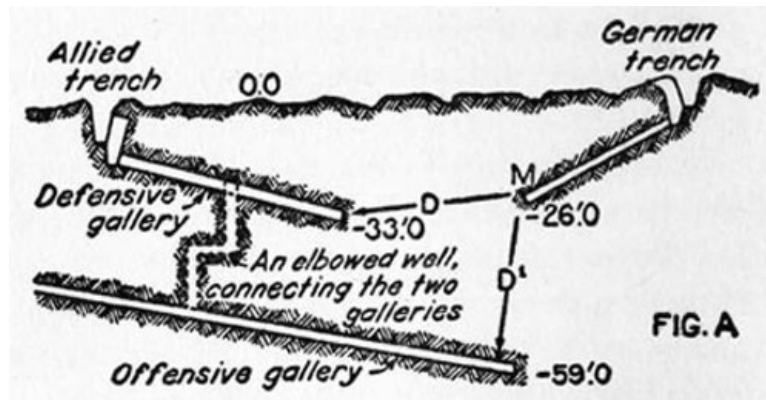
The underground struggle which ensues must aim at clearing the ground by destroying the enemy's galleries, and at holding him to one part of the front whilst the attack passes elsewhere (to one side, above or below) by working quicker.

In order to do this successfully, it is necessary to get ahead of the enemy and strike before he can do so, to go for the flanks of the enemy's galleries, to strike as hard as possible, and to strike only when within good range.

To insure this it is required to have an accurate plan of the mines, a well-organized system of information, and decision and rapidity in execution. The value of a blow on the enemy's flank by placing the charges at the sides of branches or galleries will be enhanced.

In meeting the enemy underground, maximum-charge camouflets are largely employed. These will naturally vary with the depths at which they are placed.

To strike within good range requires great coolness. Every explosion causes a temporary delay in the attack, because it will damage part of the gallery leading to the charge. A mine should be fired only when it is considered that it is likely to do more damage to the enemy than to ourselves.



The preceding sketch illustrates a plan adopted by the French which may be used in suitable soil for the offensive. This procedure often gives good results in deceiving the enemy. He thinks he is protecting himself. The defensive gallery starts from the front line and the offensive from the support. Both galleries are in the same vertical plane, the second being more advanced in the direction of the enemy. In the top galleries very little attempt is made to deaden the noise, while work below is carried on silently. An enemy listener easily confuses one with the other, and the offensive gallery passes under him. Distances D and D' are the same. The miner M confuses the two sounds, and the offensive gallery passes under him.

(NOTE: In many of the districts in France, where a sandy clay forms the top-soil and a hard chalk the subsoil, this method could only be adopted with difficulty, as the conditions are reversed. The top gallery being in clay, it would be comparatively easy to do noiseless work there, but extremely difficult to carry on the lower chalk gallery without noise.)

Referring to sketch C, direct attack may be made in this manner, or this method might be used as a feint, while the enemy is driven around behind the gallery at another point.

The usual measures of precaution employed in ordinary warfare above ground must be taken below ground whenever the distance of the enemy and the nature of the soil do not exclude all possibility of a mining attack.

It is essential to have: An efficient lookout and listening service (observation of enemy's work above ground, and listening-posts above and below); Means of defense underground—countermines.

The most reliable information will be obtained by underground listening with portable listening-instruments, such as the geophone, etc. Much confirmatory evidence is obtained by listening patrols at night in "No Man's Land" and by a careful survey of enemy trenches.

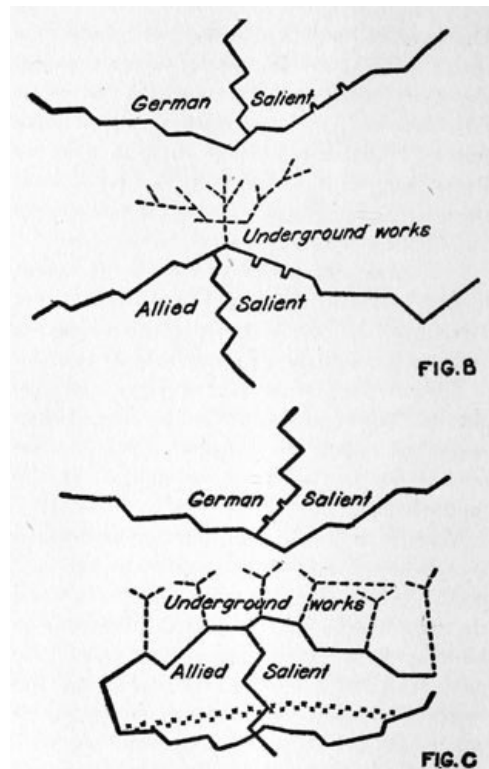
Several different arrangements can be adopted. The fan-shaped arrangement as shown in Fig. B, or the arrangement of independent parallel galleries (Fig. C). The second arrangement is preferable. The interval between galleries varies with range of listening in different soils. In clay, the distances between galleries should not be greater than 60 feet. In chalk this may be safely doubled. Listening-galleries are usually put out in Y-form, and these galleries are of smaller size, often 3 feet by 2 feet in cross-section. If desired, holes may be bored from the ends of these listening-galleries and geophones placed in them. Where time, material, and personnel permit, the mine-shaft is put in at the support-line instead of from the front line. This can only be done, however, when the situation allows of it. The galleries in Flanders seldom reach a greater depth than 25 feet to 30 feet, but in the districts farther south, in the chalk country, mining operations are conducted at any depth from 80 to 150 feet. A comprehensive German mine system was found in the Somme district at 200 feet. Naturally, it is a distinct advantage to get one's own defensive system in first and then sit tight and listen for enemy work.

The best defensive is often a strong offensive. A concrete instance of this is furnished by the experience of a British mining company who were ordered from Flanders to trenches in the chalk district at the Vimy Ridge to meet what was termed "an urgent situation" underground. The Germans were mining from chalk galleries at depths varying from 60 to 100 feet, and inflicting heavy casualties on the infantry occupying the British trenches by blowing large mines under their advanced positions. As a result the infantry were obliged to abandon many of these forward positions. The hard chalk subsoil of this district was covered with a sandy clay top-soil varying in thickness on this sector from 1 to 30 feet in depth. Some defensive galleries in the chalk had been started by the French miners when occupying these trenches. The British at once undertook the construction of numerous galleries in the clay top-soil. Their rate of progress was much faster in clay than that of their opponents in chalk, in addition to which they could proceed without noise. The programme was daring but entirely successful. The enemy continued to handicap their efforts at the outset by blowing often, but within some six weeks the British had succeeded in completely establishing their mastery underground. A few camouflets were blown by them in crossing "No Man's Land," but the majority of their mines were fired directly below the enemy's first line, and in some cases beyond. So intense was the fighting that on some occasions the British blew as many as four mines a night on a 500-yard front.

The question of the blowing and occupation of craters is usually determined in consultation with

the infantry staff. Some occasions occur, as, for instance, when the enemy is met below ground, when it is necessary to fire charges which will form craters; but, as a rule, no craters are blown in "No Man's Land" until the infantry have been warned and plans made for their occupation or otherwise.

Camouflets are employed to a large extent to destroy enemy galleries when they are met below ground. The infantry officers occupying the trenches are always informed of an impending "blow" from the enemy, and dispositions are made to withdraw any troops occupying dangerous positions, such as outlying bombers' posts or automatic-rifle detachments, etc.



All ranks in the mining companies are warned not to create an alarm among the infantry occupying the trenches when enemy "blows" are anticipated. Mining officers, at their discretion, advise the infantry of the state of affairs when there is very active fighting underground and there is danger of casualties among the infantry from enemy "blows." Only in the latter event is it wise to inform them. Under ordinary circumstances, no information should be given. Considerable success in warning infantry of impending mines by the enemy has been reached by the British and French miners. They often estimate the time of enemy mines being blown to within a few hours. On the other hand, the enemy often prepare charges and hold them for long periods before firing.

It is most important to ascertain, by underground listening, the nature of the work done. Determination of the nature of the sounds in listening is of equal importance to their location.

The practice of blowing craters on every occasion in "No Man's Land" is discouraged, generally on account of the fact that it will prove an obstacle in the assault when the next infantry attack takes place.

Many craters are blown for tactical reasons, such as the obtaining of good observation-posts and, in other cases, to obtain enfilade fire from the rim of the craters blown. Previous to blowing these craters, plans will have been made with the infantry to consolidate them as soon as blown. The exact diameter of the crater will have been calculated and the position located in "No Man's Land," and a trench constructed, probably the previous night, which will intersect the rim of the proposed crater. As soon as the mine is blown, the infantry will consolidate their positions on the rims of the craters. Many craters are used to good advantage in the disposal of spoil from near-by mine-shafts. Considerable difficulty is found in obtaining new places in which to dump the spoil, especially on active mining sectors.

Many devices are employed to deceive the enemy when firing. Dummy picks are often suspended in the face of the gallery and operated regularly to imitate picking, etc. Other sounds indicating progress of ordinary work may be simulated in the gallery being charged, or perhaps rather noisy work going on in an adjacent tunnel. A little ingenuity here is advisable. Quite a large number of mines are fired at "stand-to" at dawn or dusk, average time, 4 A.M. or 7 P.M., depending on the time of year. Naturally, it is not wise to make these times regular. The "stand-to" times are common because of the fact that the enemy infantry also occupies his fire steps at these times. Care must be taken to withdraw troops occupying dangerous positions.

In the event of blowing a series of mines under the enemy trenches, plans are devised with the infantry in an endeavor to induce the enemy to occupy his threatened trenches in force. This may

be effected by a "false" infantry attack, and other means.

The mine is an irresistible means of launching an attack. In a mined sector, the best troops completely lose their bearings for several seconds after an explosion. These several seconds prevent the machine-guns from firing, and the assailant gains a foothold in the first line, and often in the second. The extent of the underground operations in launching an attack naturally depends upon the size of the offensive, whether it be a battalion, brigade, division, or army offensive. The date has been set for the general attack. Mining units, in consultation with the staff of the forces employed, will elaborate their plans for the mining operations. (The battle of Messines furnished an excellent illustration of the value and use of extensive mining in launching an attack. In these operations, the British miners fired a large number of mines from galleries under the enemy front line, and in some cases below their supports. The charges in these mines varied from 15 to 50 tons each, and were all fired at "zero" hour, the minute at which the infantry goes over the top. Nine hundred and fifty thousand pounds of ammonal were used. Some mines had been charged for fourteen months and others for a year. One charge of 95,000 pounds formed a crater 125 feet deep with 186 feet diameter. The largest crater formed was from a charge of 70,000 pounds, depth of crater 86 feet, diameter 260 feet. These mines were in chalk and clay. The result was a complete demoralization of the enemy, and the first objectives were obtained with very few casualties.) The Germans deserted their lines for half a mile to the rear. These mines were fired on a front of several kilometres. The scheme of the offensive having been planned, galleries are driven under the enemy trenches and all charges laid ready for firing.

Throughout the brigade or unit attacking, all watches carried by officers are synchronized so that at "zero" time all mines are fired simultaneously. Frequently mining units are detailed to go over with the infantry in raids, or follow them over in attacks, for special demolition work, in which event they will usually carry portable charges of high explosives, and destroy enemy mine-shafts, dugouts, etc.

The use of mining to destroy the numerous enemy reinforced concrete shelters is now coming to the fore. Artillery-fire, even of the heaviest character, often fails to destroy these shelters, and engineers are called on to destroy them by tunnelling and firing with high explosives. In most cases, it is usually essential for the success of the work that a sufficient depth of clay is found, in order to proceed without noise. On some occasions they have been destroyed from tunnels in chalk, but this is increasingly difficult with the enemy's improved methods of listening. Smaller galleries must usually be driven. It often happens that very little cover to these galleries can be obtained and the work is more hazardous, but the success of these operations is undoubted if careful measures are adopted.

In June, 1917, the writer's company destroyed a German reinforced concrete machine-gun post by tunnelling from the Hindenburg line for a distance of 200 feet, through an average of 7 feet of clay above the chalk. For most of the distance, only 2 feet of cover was possible, but the operation was completed in a few days, and with a charge of 500 pounds of ammonal, placed right up against the concrete, succeeded in entirely destroying this German defense, and largely assisted the infantry in capturing another 500 yards of the enemy Hindenburg trench.

In the instance referred to, the enemy had a listening instrument set up in the chalk, but had evidently failed to hear the work in the clay above.

Nearly all the German trenches are undermined by a series of subterranean galleries, thirty feet or more in depth. As they retreat, in addition to building blocks or breastworks in the trench on top, they will also blow the tunnels underground. It sometimes happens, however, that these underground galleries are not destroyed behind them, and the enemy have taken advantage of this situation by waiting until the trenches are occupied in force by the pursuing troops, and then blowing big mines under them. Careful investigation of the enemy trenches occupied after an advance is essential, though this obvious precaution is sometimes overlooked. In all mining work of this character, speed and silence are of first importance.

No. 55.

LINE CORPS SUMMARY OF INFORMATION

Received up to 6 p.m., 17th August, 191—

CONFIDENTIAL. This document is not to go beyond Battalion or Battery Commanders who are responsible that no copies risk falling into the enemy's hands.

1. *BRITISH OPERATIONS.*

1. (a) During last night and to-day on the *11th Divisional front* the 6th Lincolns Regiment and the 6th Border Regiment, by a series of enterprising patrols and bombing attacks, succeeded in occupying the whole of *CONSTANCE TRENCH* up to R. 33. a. 5. 4., near which touch was established with the 34th Brigade on their right, the whole of *DANUBE TRENCH* was also occupied and bombing posts pushed out to near *JOSEPH'S TRENCH* in R. 32. b.

The enemy who had been holding these trenches fled in considerable confusion, leaving their rifles behind them.

Point R. 32. c. 3. 9. was also occupied and direct communication opened with the

49th Division holding the LEIPZIG SPUR.

(b) On the 49th *Divisional front 2* (diagonal) Lieut. Storm of the 5th York and Lancaster Regiment, who had been ordered to obtain an important identification, personally reconnoitred the enemy's trenches about R. 19. c. 8. 4. Returning he then led two platoons against the selected point and succeeded in forcing an entry. Considerable losses were inflicted on the enemy both by our surprise artillery barrage and during the bayonet and bomb fight which followed.

The one prisoner necessary for identification purposes was duly brought away and the raiders returned with a loss of one man killed and a few wounded.

(c) A German 5.9 Howitzer originally captured by the 48th Division near R. 32. c. 9. 1. and since covered by shell earth has been found again to-day.

2. A hostile balloon (location unreported) was seen to fall in flames about 3 p.m.

3. *Artillery.*

25 direct hits on emplacements have been reported during the last 24 hours.

At one position the pit was entirely blown away, 2 explosions occurred, and the dugout into which 2 Officers had been seen to run received 2 direct hits; several corpses were seen lying about.

About 12 noon to-day one of our batteries caused a large explosion at R. 26. c. 3. 4. This was probably an ammunition store which has been reported by several prisoners to be located at this point.

4. *Prisoners.*

During the last 24 hours 9 prisoners have been captured by the II Corps, of which 7 were wounded.

Total captured by II Corps up to 6 p.m. on 17th 26 Officers and 1,523 other ranks.

Total captured by Reserve Army up to 6 p.m. yesterday 77 Officers, 4,478 other ranks (including 970 wounded).

2. *ENEMY'S OPERATIONS AND MOVEMENTS.*

1. Air reconnaissances carried out this morning report that a considerable train movement on the line from CAMBRAI to BAPAUME.

No large movements of troops or transport were seen on the roads in the area opposite the Corps front.

2. Much traffic on the IRLES-GREVILLERS Road, both ways, is again reported.

3. SCHWABEN TRENCH is evidently occupied round about R. 33. a. 2. 7., men having been seen moving around there during the day.

4. Yesterday the enemy blew up ammunition in evacuated gun pits to the Northeast of COURCELETTE, but it cannot be said there are definite signs at present of withdrawal from the line South of the ANCRE.

5. *Hostile Artillery Activity.*

Normal during the last 24 hours. LEIPZIG Salient, AVELUY, PIONEER ROAD in W. 16. b., the MESNIL area, WONDER WORK and THIEPVAL WOOD have been shelled during the day.

Enemy's trench mortars have been quiet.

3. *ENEMY'S DISTRIBUTION, DISPOSITIONS and ORDER OF BATTLE.*

See Annexe.

4. *ENEMY'S DEFENCES.*

(a) *Machine Guns.*

An emplacement, believed to be new, has appeared in BULGAR Trench about R. 26. a. 2. 4.

Machine Guns have been located at:—

R. 25. b. 7. 7. }	Prisoners statement
R. 19. c. 1. 5. }	
Q. 24. b. 1. 1. }	
R. 27. c. 3. 8. }	

(b) *Dugouts Reported Occupied.*

R. 31. a. 53. 37.

R. 32. a. 0. 9. to 2. 8.—holding 1 Company of the 77th R.I.R. (Prisoners statement).

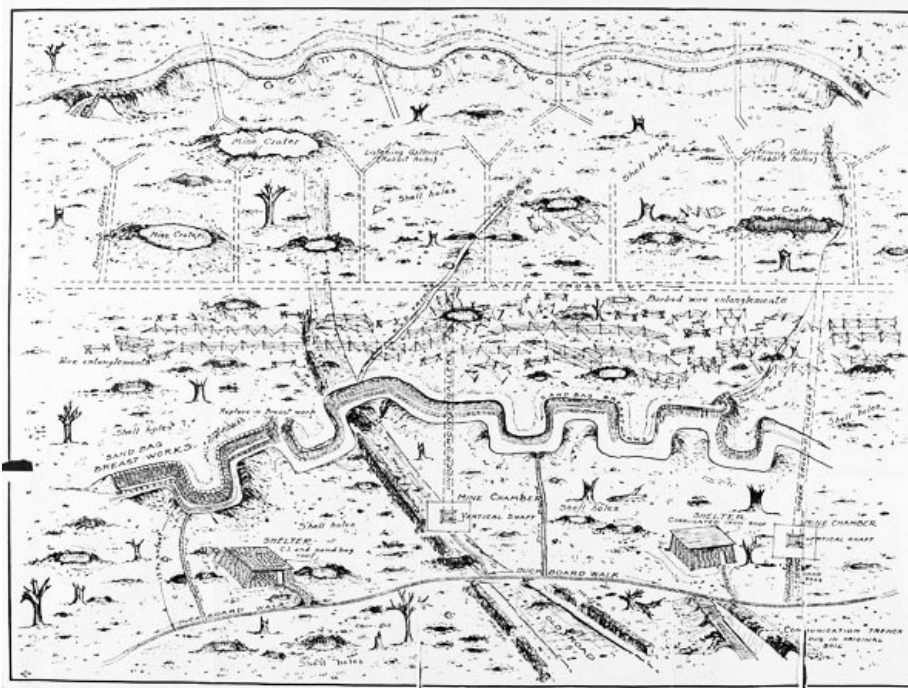
R. 27. d. 1/2. 3.

(c) *Headquarters Located.*

H.Q. of the 45th Res. Divn. is reported to be in HAPLINCOURT.

H.Q. of the 212th Res. Regt. HAPLINCOURT.

H.Q. of the 211th Res. Regt. LE BARQUE. Battle H.Q. of this Regt. is in dugouts about 200 yards behind WARLENCOURT.



ROUGH SKETCH ILLUSTRATING BREASTWORKS AND SYSTEMS OF UNDERGROUND GALLERIES.
Dotted lines represent galleries and tunnels from twenty to twenty-five feet underground.

Transcriber's Note:

Minor typographical errors have been corrected without note.

Irregularities and inconsistencies in the text have been retained as printed.

*** END OF THE PROJECT GUTENBERG EBOOK FIGHTING THE BOCHE UNDERGROUND ***

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