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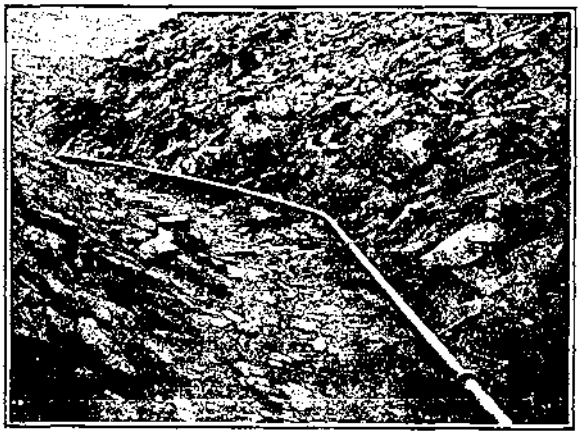

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NON-POLITICAL TRADE UNIONISM.

A Lecture delivered at the S.M.E., Chatham, on October 4th, 1928, by W. A. APPLETON, Esq., C.B.E., *Secretary of the General Federation of Trade Unions.*

NOTHING is so conducive to accurate thinking and satisfactory understanding as careful definition. To express clearly, even to oneself, terms or propositions to be advanced, is to anticipate and prepare for criticism, and perhaps to avoid unpleasant reverses. If this ideal were realizable, if it were always possible for truly scientific minds, after carefully defining, to analyse, and pursue to logical conclusions, every catch phrase which disturbs the public peace, and then to broadcast the results, three-fourths of this country's industrial, social and political turmoil would be avoided. Indeed, it may with truth be said that our commonest troubles are those arising from proposals, attractive enough in appearance, but impossible of realization ; which are put forward by suffering people who cannot think, by careless talkers who will not think, or by persons who only think of political advancements and emoluments. The first class deserve to be pitied, the second satirized and the third court-martialled.

A very large number in this first class belong to trade unions, or to those who are associated with trade unions, and when studying them, their organizations and their association with political parties, it is desirable to differentiate between trade unionism and trade unions, and to say what we mean by politics. Of trade unionism and trade unions—one represents the spirit of the movement, the other the structure. The former is older and wider ; it goes back to the brickmakers employed by Pharaoh, or even beyond, and is practised by the professions as well as the trades.

Forms of trade unionism appear to have existed in Rome, under the Cæsars, and also slightly later, in France and Asia Minor.

Examinations of the foundations of Notre Dame, in Paris, afforded evidence of the use of materials from the Temple of Jupiter which, it is stated, stood upon the same site. Amongst the discoveries made by the excavators was an altar, whose inscriptions indicate that it was placed there by the Boatmen's Union of the Seine ; which is asserted to be an off-shoot of the original Boatmen's Union of the Tiber.

In Sardis, Asia Minor, Mr. W. H. Butler, an American Economist and Archæologist, is said to have discovered a tablet which records

a building trades' agreement bearing date of April 27th, 459 A.D. This agreement follows upon what appears to have been a lightning strike, for work was left uncompleted. The settlement ultimately effected was a collective one, and covered conditions of employment, wages to be paid and penalties for default.

If antiquity confers respectability, trade unionism is amongst the most respectable of movements. If opposition strengthens, then trade unionism should be one of the strongest of movements; for when Cæsar became Emperor, he issued edicts against it, and Cicero carried a measure through the Roman Senate, which made a number of workers' craft organizations illegal. Our own thirteenth to nineteenth century prohibitive, or restraining legislation, seems, therefore, to have been imitative rather than original.

Trade unionism is not a constant proposition, or an exact science like mathematics. Rather may it be described as a movement actuated by human desires and bounded by economic possibilities. This being the case, its inconsistencies and its selfishnesses, as expressed in the professions and amongst the manual workers, may cause annoyance, but ought not to occasion surprise. It would be wiser if these expressions were regarded as inevitabilities, and either encouraged or repressed, as they made for, or against, the common good.

To attempt even this method of apprehending and directing, and if needs be controlling, craft and professional unionism, it will be necessary to study the philosophy—that is the causes, the circumstances, and the aims of the movement—and also its history. Especially is it necessary to study that portion of trade union history which deals with the structural and operative sides —that is, how constituted, how directed, and what means are used to enforce policies.

The genetic causes of trade unionism are to be found :—

(1) In the eternally operating desire of men to secure the fullest material reward for personal effort, and in the early realization of the increased effectiveness of combined activities.

(2) In the equally powerful desire of other men to advantage themselves by exploiting the efforts of the less fortunate or less capable members of the human family. The clashing of these factors produced the movement.

In the professions there is the added incentive of ambition, or pride in the standing of the particular profession. Amongst the workers, additional incentive results from the desire to provide against unpleasant contingencies, such as victimization, starvation, or ill-honoured old age.

Trade unions, as we know them, and as apart from employers'

associations and organizations, are, at least in theory, voluntarily constituted for the betterment of wages, hours and working conditions; of people engaged on similar materials, using similar tools, and producing similar results. This description, by slightly varying the terms, will apply to the professions as well as to the trades.

In England, trade unions have had legal existence since 1824. In the form of Friendly Societies, they existed surreptitiously from much earlier times. Indeed, the Silk Hatters' Trade Union claims to have received Royal approval in 1576, and it is still in existence. The Cotton Spinners of Oldham have rules bearing date of 1797, and the records of the Friendly Society of Ironfounders go back to 1809. These, and contemporaneous unions, owe their origin to changing, and mostly oppressive, circumstances.

Methods of production are always changing; sometimes rapidly, sometimes slowly, but always changing. These changes bring fortune to some, misfortune to others; and, at least in their earlier stages, they appear to prejudice most those who are weakest and poorest. The industrial changes taking place in the eighteenth century were far-reaching and poignant, for they involved, amongst other disagreeable things, the substitution of the machine for the man. The free craftsman buying his own raw materials, making commodities of his own design, and acting as his own salesman, was at this time giving place to the employee, who, having neither tools nor capital, sold himself to the employer who had both.

The employer, with few exceptions, was disregarding most of his human obligations; his only thought being personal, immediate, and financial success; and the only chance the workman had of securing anything in the shape of equality of bargaining power was by combining with his fellows.

Sporadic combinations proved of little value; control was limited, communication difficult, resources easily exhausted; and so the continuously existing organization, the trade union as it is understood to-day, making careful provision for disputes, and some provisions for social disabilities, grew in favour and in strength.

The need for such unions was demonstrated by the conditions obtaining; long hours, low wages, unhealthy and soul-destroying surroundings, all clamoured for consideration and redress.

The seriousness of the industrial situation in the early part of the eighteenth century is demonstrated by the House of Commons Reports.

In 1832, Abraham Whitehead, giving evidence before a Special Committee of the House, gave poignant and substantiated evidence of the brutal practices which accompanied the employment of little children; a brutality which employers practised and parents acquiesced in. Commencing work between the ages of five and six years, they would be called out of bed, winter and summer, in time

to reach the mills before 6 a.m. No time was allowed for breakfast, food, such as it was, being snatched while at work. In summer, the time allowance for dinner varied, some mills allowing as much as from forty to sixty minutes. In winter, no time was allowed, even for the mid-day meal, but, in some cases, ten or fifteen minutes was taken. These little children, when at work, were always on their feet; they could not sit and piece, and Whitehead declared that: "It is a very difficult thing to go into a mill, in the later part of the day, and not hear some of the children crying for being beaten; some have been beaten so violently that they lost their lives in consequence."

In Kirkheaton Churchyard there is a monument, erected to the memory of seventeen children who, in 1818, lost their lives at the burning of Atkinson's Cotton Mill, Colne Bridge. The fire broke out during the night shift, and while the children were locked in. The foreman who had the keys in his possession failed to open the doors, and seventeen lives were lost. The eldest victim was eighteen and the youngest, nine! This occurred, not in darkest Africa, but in benighted England; not in mediæval ages, but in 1818, and at a time when little children were being taught to sing:—

"I thank the goodness and the grace
Which on my birth has smiled,
And made me, in these Christian days,
A happy English child."

Low wages, high prices, and soulless cynicism, were aggravated by the practice of "truck"; a system so nefarious that Parliament made it illegal in 1831. This system enabled the employer to make profits both ways—out of his employee as producer, and also out of him as consumer; for in addition to compelling him to work long hours for low wages, it also compelled him to purchase some at least of his meagre domestic necessities from his employer's store, and at the latter's prices. Sometimes the workman was compelled to pay for lighting and for shop room; and, though the restraining Act was passed in 1831, Parliament, in 1842, was constrained to take further proceedings; while in fact the practice persisted to 1870 or even later.

In the tragic days preceding the passage of the 1871 Trade Union Act, even though the Combination Laws had been repealed, and Trade Unions made legally possible, persecution and mal-interpretation of the law still made organization difficult, and intensified the struggle between those who employed and those who were employed. The recorded cases of the Printers, the Weavers, the Coopers, the labourers of Tolpuddle, and other Unions, show how great is the historical justification for the antagonism which exists towards the employing class.

In 1810, the Journeyman Printers in London suffered sentence under the 1800 Statute, while in 1824, the great year of repeal of these Combination Laws, the Scottish Weavers were prosecuted for calling a strike to enforce a wage rate actually fixed by the Justices. They were convicted and sentenced to terms of imprisonment extending from four to eighteen months. There were occasions when the Courts declined to convict, but these occasions formed the exception rather than the rule. In 1821, members of the Coopers' Society were arraigned at the Old Bailey before Newman Knowles, Esq., Common Serjeant of the City of London, on a charge of conspiracy. The indictment contained sixteen counts; it declared that the workmen, who were named, together with diverse other evil-disposed persons, to the number of one hundred and more, being workmen and journeymen in the art, trade and manual occupation of a cooper, wrongfully, unlawfully and unjustly did contrive and intend wrongfully and unjustly to increase and augment the wages of themselves and other workmen and journeymen in the said art, trade and occupation, and unlawfully and unjustly to exact and extort, great sums of money for their labour and hire in the said trade and occupation, from the masters who employed them therein.

The other counts vary little in substance, but the third count states that the object of the conspiracy was to demand and exact and obtain, for themselves and *other* workmen, one shilling a day more than they had before that time been accustomed to receive.

Seven counsels were employed, three by the Crown and four by the men. The verbatim report of the trial fills two hundred and fifty pages of fairly close print. Short extracts from the Common Serjeant's summing up, and an incident after the verdict was given, indicates his bias. He said to the jury: "You have heard of men having a right to demand what they please, and that these men were to be crushed to the earth and to be ground to powder; such topics might suit meetings which were held for these *illegal* purposes; no persons have a right to insist on what they, as a body, shall receive from their employers, and, if that principle was to be adopted, there would be an end of all commerce. . . . These men have received, all of them, without exception, very good characters, but character weighs less in this case than in any other. . . . It has been said that this is not a conspiracy by the defendants to raise their *own* wages, but I think, so far as that observation is entitled to any weight, that it operates as an exaggeration, and not an extenuation of the offence, because the men who are to derive their support from their wages are more excusable certainly, in attempting to raise their wages, than those who are not to receive any part of it, but who join in an illegal conspiracy to enable other persons to get greater wages." Evidently the Common Serjeant was not himself an altruist, nor did his philosophy visualize the idea of doing unto others as one would be done by.

In spite of the Common Serjeant's summing up—perhaps because, and in reprobation of it—the jury brought in a verdict of "Not Guilty" on all the counts and in respect of all the defendants. The announcement of their verdict brought expressions of approbation from the people in the Court, and of temper in the Judge, who ordered: "Officers, mark those persons who disturb the Court and take them into custody!"

The case of the labourers of Tolpuddle, in Dorsetshire, affords what is regarded as a classical example of prejudiced application of perverted law. In 1833, these labourers, who were receiving 7s. per week, heard that others in different parts of the country were receiving 10s. They approached the farmers who were their employers, met them in the presence of the parson, and were conceded an agreement for 10s. per week. A little later the men were ordered to go to the County Hall, and there were magisterially told they must work for what their employers thought fit to give them. This intimidatory advice was followed by an immediate reduction to 7s. per week, and the threat that they would shortly have to be content with 6s. Having in this way effectively learned that it would be vain to seek redress from employers, magistrates or parsons, these men decided to form a trade union.

That they had no intention of acting against the King's person, or his realm, is proved by their rules which declared: "That the objects of the Society can never be promoted by any act of violence, but on the contrary all such proceedings must tend to injure and destroy the society itself."

Only a little time elapsed between the formation of the Union, on the 21st October, 1833, and the outward and visible expression of opposition by the employers; for on the 21st February, 1834, just four months after the Union's formation, placards were posted in the district, warning the labourers that membership of the Union was a crime, punishable by seven years' transportation.

No demands had been preferred by the men, no employers threatened in person or goods, but, within three days of the placards being posted, six labourers were arrested and thrown into jail. Though the Combination Laws had been repealed in 1824, and this was 1834, these labourers were sentenced to seven years' penal servitude, just the period threatened by their enemies prior to their arrest. An old and forgotten Statute was invoked against them; a Statute devised for entirely different purposes, but which dealt with the taking of oaths and the adoption of passwords. These labourers had, unknowingly, transgressed some of the regulations of this forgotten Statute, and seven years' penal servitude was their sentence.

The Times, on the 1st April, 1834, declared: "That all Freemasons and Orangemen . . . might, with equal justice, be sentenced to

transportation by reason of them having taken secret and unlawful oaths, such as taken by these poor fellows." In studying this trial, it is difficult to escape the conclusion that, if this Statute against the taking of oaths should happen to be resuscitated, some of the good soldiers I have known would spend most of their lives in jail!

That the spirit which dictated the Statute and the sentence continued to exist, was confirmed by personal experiences in the later years of the nineteenth century; these experiences vitiated the surprise, though not the disquiet felt, when the trade unions turned their attention from economic to political action; from securing equitable shares in the profits of production, to controlling shares in the affairs of the State.

The earlier conceptions of trade unionism in Parliament presupposed representation rather than domination. The movement had accomplished wonderful things in respect of industrial and social ameliorations, but they constantly found themselves checked, or even check-mated, by oppressive legal interpretation, or by resuscitation of laws passed in other times and to meet different situations. They had spent many millions in relieving unemployment, sickness, old age, and in the interment of deceased members; but industrial conditions, as governed by legal enactment and interpretation, eluded them, and were far from being satisfactory. Parliament was in the hands of those who were their industrial opponents; to associate with these was to acquiesce in tortuous and tortoise-like progress. Some members of Parliament, out of sagacious goodness, had assisted the trade unionists, but the majority were against them; why not, therefore, replace these members by men of their own class and habits of thought?

The reverberations of the French Revolution and the fulminations of Karl Marx, were appealing to people who suffered under stupidly harsh applications of obsolete laws, and who remembered the unscrupulous brutality which had characterized industrial expansion. To many, incitement to political control seemed like the call of God. Incapable of chicanery themselves, they rarely suspected it in others, and believed, in all honesty, that political power, of necessity and as a matter of course, involved economic efficacy, industrial progress and social regeneration. Dissatisfied with that limited Parliamentary representation, which had been permitted through association with Liberals and Conservatives, they hailed the idea of a Labour Party, consecrated to the achievement of their ideals, with rather modified but fairly general enthusiasm.

The Trade Union Acts of 1906 and 1913, gave both trade unionists and adventurous politicians opportunities which other times and enactments had denied them. In effect, the Act of 1906 abrogated the Law of Conspiracy as this affected Trade Unions, because, so far as they were concerned, it abolished torts, tort being a term

including all those wrongs, not arising out of contract, for which remedy by compensation or damage is given by law.

The addition of a few words to the first paragraph of Section 3, of the Conspiracy and Property Act of 1875, materially altered its original intention by declaring that: "An act done in pursuance of an agreement or combination by two or more persons, shall, if done in contemplation or furtherance of a trade dispute, *not* be actionable unless the act, if done without such agreement or combination, would be actionable (Section 1)."

To add definiteness to the alteration, Section 3 (of the 1906 Act), declared that: "An act done by a person in contemplation or in furtherance of a trade dispute, shall not be actionable on the ground only that it induces some other person to break a contract of employment, or that it is an interference with the trade, business, or employment of some other person, or with the right of some other person to dispose of his capital or his labour as he wills."

Whatever the legal interpretation of these clauses may be, the interpretation deduced and acted upon by the trade unionist, and those advising or profiting through him, was that no action would lie against him if it could be pleaded that interference with the individual, or conspiracy to secure breaches of contract, arose in contemplation or in furtherance of a trade dispute. The fact that legal action has seldom or never been taken confirmed their opinion.

This opinion was further encouraged by the Trade Union Act of 1913, which amongst other things, empowered Trade Unions, by a majority vote of the total membership voting, compulsorily to extract a general and continuous contribution to the funds of a particular party; this, of course, being the Labour Party. This Act of 1913 reversed ordinary practice in the matter of contracts by compelling contracting out of a not previously existing liability, instead of contracting in. As a specified form had to be applied for, and filled up, and signed and returned to the secretary, and some obloquy incurred, the non-contents—the Liberals and Conservatives—went on paying rather than run the risk of ragging.

Political trade unionism became an organized force when, in 1890, the Labour Party was brought into existence. The 1913 Act was to this Party what an addition to a deficient commissariat is to an army.

Considerable difference of opinion exists as to what constitutes a political trade union. It is quite fair, I think, to say that a trade union becomes political when it identifies itself with or undertakes continuously to subscribe to the funds of any particular political party, or when, as a matter of considered policy, it uses industrial power to assist a political party to secure political objects; irrespective of the effect of such action upon the union's industrial prospects.

Politics has been defined as the art of government. At best, the term should imply much more, for it should be expressive of science as well as art; of knowledge acquired, methodized, and made applicable to thought and movement; as well as to skill and manipulative dexterity when dealing with human and economic factors. The term should presuppose, not merely the idea of controlling men and affairs, but also the intention of directing both these along constantly ameliorating planes of ethics and activities. Politics, therefore, may be described as a term postulating apprehension and direction of the desires and affairs of men and nations; and a politician as one who, amongst other things, should be well skilled in the art of applying deductions drawn from psychological and historical knowledge.

There are, admittedly, other definitions and conceptions of politics and politicians, and these not so flattering as the idealistic ones now submitted. In all countries there are politicians who pay little regard to the ideal, but who regiment themselves for the purpose of securing control, direction and emoluments. In Great Britain there are three generally recognized groups, each having its share of idealists and adventurers—Labour, Liberal and Conservative; or, if you like, positive, comparative and superlative. No one, in view of its utterances and activities, will deny Labour's claim to be positive, though there may be some differences of opinion over the allocation of the terms "comparative" and "superlative."

To each of these parties, their members and their executives, are ascribed intentions, qualities and capacities entirely outside my own idealistic description. Artful, cunning, crafty, foxy, untruthful, mercenary, unscrupulous, machiavellian, are amongst the milder epithets applied by opposing factions.

At the moment, and for the present purpose, I am willing to postpone consideration of the baser kind of politician, and temporarily at least, assume that my description of politics and politicians holds the field. If that is agreed, one sees at once how great are the issues involved, how wide are the psychological and physical areas to be covered, and how futile must be all attempts to subordinate real politics, which would take cognizance of international, as well as national and local desires and potentialities, to the exigencies of the trade union or any other particular movement. Yet this is exactly what has been attempted, particularly during the present century.

The hopeless impracticability of this policy is obvious to the thinker who is intelligent and honest. Unfortunately, men desire first, and think afterwards, and to only a minority of those who find themselves compelled to think can we unreservedly attribute the qualities of intelligence and honesty.

In this problem, as in many others, elements of truth which it contains increase the difficulty of exposing fallacy. It cannot be

denied that some trade or occupational unions benefit by political action. Obvious instances are the National Union of Railwaymen, the National Union of Teachers, the Post Office Workers, and various unions enrolling civil service workers. Even here, however, purely partisan politics may, if long views are taken, become a serious disadvantage (*e.g.*, N.U.R.). For the unions enrolling workers engaged in competitive industries, especially where competition is from overseas, and where economic pressures render sentiment ineffective, the independent policy is the better one. This permits negotiation between trade union officials and employers' representatives not being prejudiced by political predilection, and ensures a better chance for purely industrial and economic subjects.

It is frequently said that trade unions sometimes act against the common interests of society; so do the professions and so do employers and employers' associations. No one suggests that meat and milk distributors are unadulterated philanthropists.

The way to prevent or mitigate the evils which exist in this connection, is not easily ascertainable. It is not by ill-considered applications of force. You cannot compel employers to pay uneconomic wages; neither can you compel—or at least, you ought not to compel—workpeople to accept wages which do not provide subsistence. As Cæsar and Cicero failed to suppress, so shall we. Unions, trade and professional, will openly or clandestinely continue to exist, and this so long as industrial or occupational grievances run across human desire or need, or until all their functions are absorbed by the State, or until the removal of injustice and unfairness is scientifically and religiously undertaken by the whole community.

In conclusion and in extenuation of many things, let me say that in the sense that trade unionism involves combinations against industrial aggression, it has been in existence thousands of years and will probably continue until the millennium. In its modern form it has ebbed and flowed; made mistakes and recoveries; attempted too much and done too little, particularly since it went into politics; but, industrially speaking, it has been the one force making for equality of bargaining power and just dealing between those who buy labour and those who sell.

Critics, many of them honest and capable workers at their trade, complain that in entering into party politics it has wandered, or been led, outside its proper and practical functions. Perfectly true, and its errors should be explained and condemned; but it ought not, any more than Christianity, to be judged by all the silly things done in its name.

THE 23rd (FIELD) COMPANY, R.E., IN THE GREAT WAR, 1914–18.

(Continued.)

By MAJOR R. L. BOND, D.S.O., M.C., R.E.

PART III.—NOVEMBER, 1914—SEPTEMBER 30TH, 1915.

Battle Honours during the period—"Aubers," "Loos."

THE period, November 17th to December 20th, was spent in rest at Borre.

Capt. H. W. Herring, R.E., joined the unit on November 18th, *vice* Capt. Addison.

The first few days were spent in cleaning up, overhauling tool carts and general stock-taking. The latter process disclosed an unexpended surplus of about 100 lbs. of "plum and apple," more tobacco than could be smoked in a year, and vast quantities of shirts, the gifts of generous friends in England. Stafford, revisiting the farm in 1918, found a bale of these shirts still unopened and jealously guarded by our good friends the Oudinots, who always retained a great affection for the Company.

The time was spent in work on roads suffering from heavy traffic and severe weather, repairs to infantry billets and improvements to horse lines, and very largely in design and construction of various types of trenches, embodying the lessons learnt during the previous two months. These lessons were :—

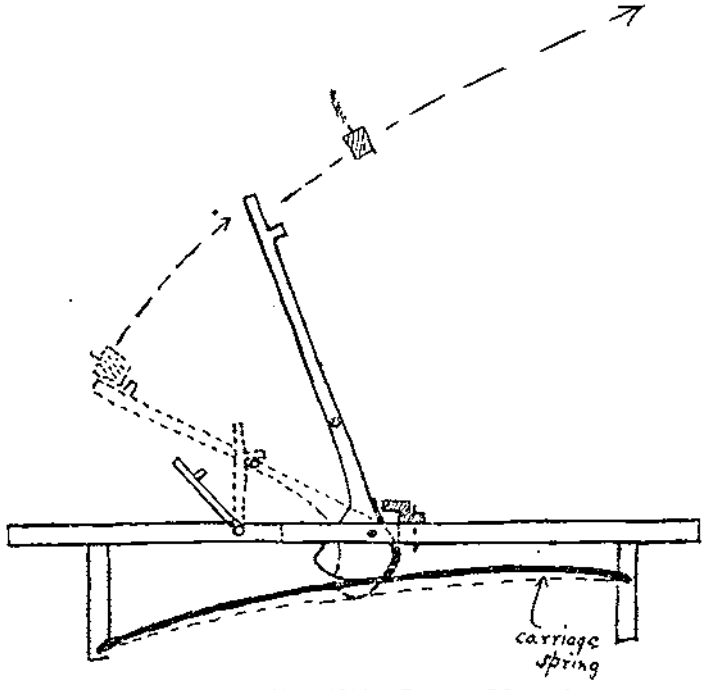
(*a*) that overhead cover to a fire trench was undesirable, being no protection against H.E. shell ;
(*b*) fire bays not to be more than 15 feet in length ;
(*c*) ample traverses ;
(*d*) plenty of room in the fire trench for traffic without interference with firers.
(*e*) the practice of undercutting the firing parapet for protection from weather and shrapnel fire was most undesirable and dangerous.

The method of provision of shelter still remained to be solved.

Much time and thought was expended on the design and construction of some form of bomb-gun. The jam-tin bomb was now almost a standard article, and the problem was to throw it as far,

as accurately, and as silently as possible. Each Section in the Company had its pet design. Some people found it necessary to go to Paris to obtain powerful helical springs to make a gun working on the pop-gun principle. This was not a great success, throwing the bomb some 50 to 60 yards. The cross-bow principle was tried, but there were difficulties in obtaining sufficient powerful elastic. One gun (Sketch No. 9) of simple design, weighing about 30 lbs., was more successful, based on the principle of many a toy cannon of childhood days. This gun threw a bomb 80 yards with accuracy.

SKETCH No. 9.



Bomb Gun. Nov. 1914. Range: 80 yards.

The experimental model was taken into the trenches on Christmas day, but in the excitement of coaxing an unwilling fuze to light, the inventor unwarily placed his face in the arc of movement of the arm, the fuze spluttered, the trigger was pulled and the gunner received a powerful buffet which stretched him alongside the weapon. However, the bomb was duly thrown to the right place, but the gunner had cut his face open, and on returning early next morning found the beloved weapon had been used for cooking a guardsman's bacon. The design was handed over to the new bomb factory in Bethune, where it was improved (!) by the expert mechanics into a gun weighing about 90 lbs. and throwing a bomb not more than 50 yards. The child was still-born.

Brainwaves from the War Office were sent out for trial, mostly suggestions for putting up wire without getting out of the trenches. Much joy was caused by some of these, particularly one bright patent. This consisted in coiling a rope several times round an expandable drum of wire. The end of the rope was fastened to a pole so that when the wire coil was lifted on the parapet and the fisherman made his cast the coil rolled forward some ten yards. Two gillies assisted by pulling ropes attached to the ends of the coil, which was thus expanded. It not only expanded but, of course, rolled back into the trench.

On December 3rd, His Majesty the King paid a very welcome visit to the Division, the units being lined up on the main road for inspection.

During this time, visits were paid to the Sappers and Miners at Le Touret, a billet we were to know well later on, and to the French Cie du Génie of the 32nd Division, who had taken over our old bridge near Boesinghe.

At last, in the middle of this peace, an order was received at 3.30 p.m., on December 20th, to move immediately. This was cancelled at 4 p.m., but at midnight an order arrived to march at 7 a.m. on the 21st, to the neighbourhood of Bethune. The horses had for some time been out at grass in a paddock surrounded by high hedges, but on this particular morning, of course, it was discovered that about 30 horses were missing. Nearly all were recovered, grazing quietly in the neighbourhood, in time to move off at 7.0, but six draft horses, Alexander the Great (Bond's horse, a fine, well-mannered, dark chestnut, with an Olympia record), who had jumped out of the field, leading the rest and R.B.'s two cobs, were nowhere to be seen. No. 2 Section, therefore, was left for the time. A search eventually discovered the six hairies wallowing in turnips about a mile away, but the riders had disappeared.

Some two miles from Locon, Capt. Herring and No. 2 Section, after a long march in a wet and depressing day, were endeavouring to trace the Company, and were much assisted by a young subaltern in the Grenadier Guards, standing outside his billet, who helped to interrogate the inhabitants. It was not till later that it was realized that our friendly interpreter was H.R.H. The Prince of Wales. Eventually the whole Company, after first making for Vieille Chapelle, was ordered to Locon.

The following morning, standing outside the billet, watching the passage of a gunner brigade of the 2nd Division, the writer noticed a B.S.M. riding Alexander the Great, followed by R.B.'s two cobs hauling a gun! The runaways were very soon retrieved to the chagrin of their temporary owners.

It will be remembered that, on December 20th, a powerful German attack had been opened against the Indian Corps at Givenchy and

Festubert and that the 1st Division had been hurried to the scene on the night of December 20th/21st to assist in restoring the situation*; by the evening of December 22nd, the 1st Division had taken over a considerable portion of the line, Givenchy and northwards, from the Meerut Division. On the night, therefore, of the 22nd December, the 23rd (Field) Company Sections found themselves assisting the 2nd K.R.R. (2nd Infantry Brigade) near Quinque Rue in the construction of a new line, in close co-operation with the Bengal Sappers and Miners on the left. The night was wet, enemy searchlights were ubiquitous and conditions very unpleasant, though the ground had not yet reached its later water-logged conditions. The flatness of the country and the winding nature of the line produced a phenomenon with which we were to become better acquainted in the spring. Shots fired near the front travelled a long way, and moving up over the flat roads to work, tired bullets would constantly strike the roads from all sorts of queer directions, whilst the area within a mile of the front was consistently unpleasant, and, except for scattered buildings, devoid of the defilading cover of the Aisne slopes. Curiously enough, however, in several months of work, the Company had practically no casualties from this source, though other units were less fortunate.

On the 23rd, the Company, having taken over the Le Touret billets from the 21st Company Sappers and Miners, spent the day in making bombs, preparing fascines and one section went forward to assist the 2nd R. Sussex.

On the night of the 23rd/24th, the unit moved to Essars and on the 24th for Cambrin, arriving late that night at Beuvray, where the generous owners of the billets provided a splendid Christmas dinner. The move to Cambrin followed the next day, Christmas Day, the sections going out almost at once to work, two sections on the pontoon bridge, 600 yards west of Pont Fixe, and two sections in the trenches.

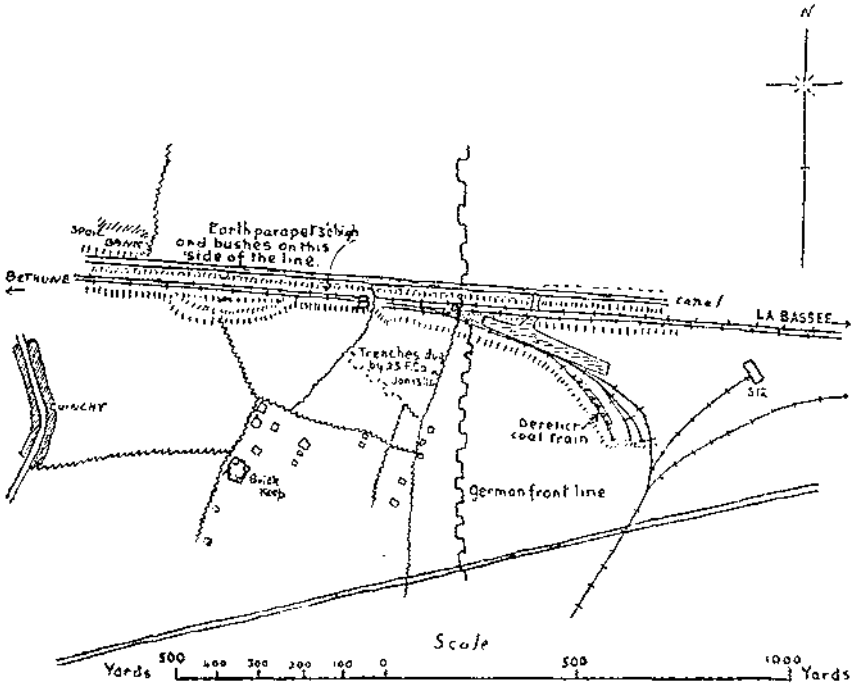
In this sector (Sketch No. 10) the Company remained for more than six weeks. The sector consisted of the brickfields north of the Bethune–La Bassée Road, a low-lying clay area dotted with stacks of bricks, each stack some 40 to 50 feet square and 15 feet high. The dominating feature was the railway embankment on the north, and the railway triangle surrounding a canal basin on which the enemy had strongly established themselves. Photographs giving a good idea of these main features are appended.

The French had been established in the brickfield for some time, and had constructed a strong fire trench with deep dug-outs (our first experience of this form of shelter), and long communication trenches running back nearly a mile to Cuinchy. In dry weather, these communication trenches, 5 to 6 feet or more deep, had stood well in the firm clay without revetment; whilst the trench bottoms

* *Military Operations in France and Flanders*, 1915. Page 21.

had been carefully laid with brick, forming a hard paving. The rain, frost and snow of December, however, very soon commenced the disintegration of the clay walls, no drainage had been provided, and the communication trenches rapidly filled almost waist-deep with a glutinous mass which made the task of carrying parties, ration parties and individuals one of superhuman effort. On many occasions, men had to be dug out and the moral and physical effect of these conditions was serious. At the same time, although the front line, and a support line some 200 yards in rear, were in fair

SKETCH No. 10.



Cuinchy Brickfields, January, 1915.

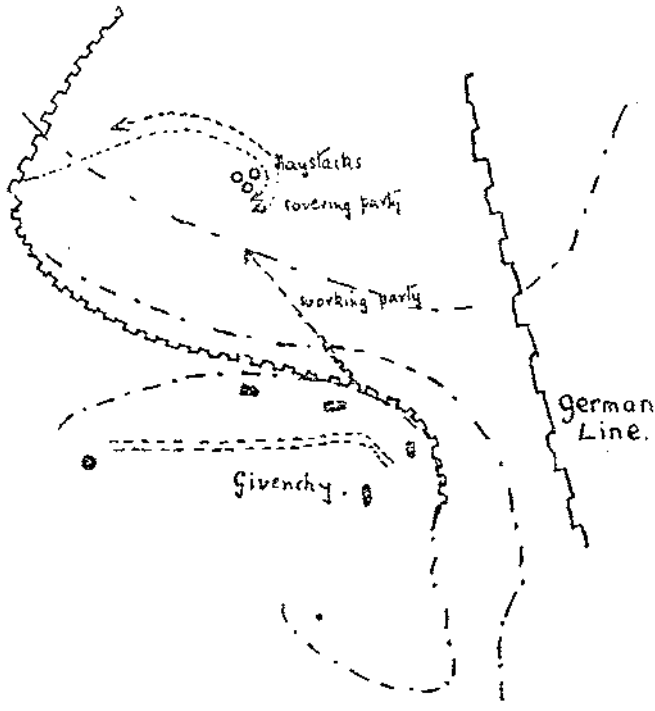
condition, there was no system of supporting points in rear of these lines, and barbed wire defences were conspicuous by their absence.

The two main works on which the Company was employed in this area, then, were the drainage and maintenance of the communication trenches and the construction of rear defences. So far as the first work was concerned it was a constant labour against odds. Large sump pits were dug, experimental pumps of various patterns installed and every effort made to drain the trenches, but the intermittent battle described below constantly interfered with this work. The main work in defence was the construction, amongst

some brick stacks standing fairly close together, of a "keep," as strong points were called at this period, made of brick. Strong brick walls, properly made with cement mortar were built, 6ft. 6ins. high, loopholes constructed, and arrangements made for all-round defence. Built amongst the brick stacks, the work was never noticed by the enemy, and was as great a success in stopping the attack of January 25th, as the Black Watch strong point had been on November 11th.

North of the canal, the ground rose gently to the village of Givenchy, and here again trench drainage and the construction of

SKETCH No. 11.



Sketch to illustrate working party at Givenchy.

"keeps" were the main work. North of Givenchy, the position was somewhat unsatisfactory after the December fighting, the line curving back before joining up with the Festubert trenches. The German line, however, had not bulged into this arc and it was decided to construct a new line from Givenchy across the chord. The operation provided a nice illustration of the difficulty of maintaining direction at night (See Sketch No. 11).

Preceded by a covering party of one platoon, Herring led the sappers out from the flank, followed by a working party of 150 men of the battalion holding the line. The party had just commenced to extend when there was a tremendous outburst of rifle fire from

our trenches, duly responded to by the enemy in front. The working party lay very tight until Herring, having wriggled out of the zone of fire, ran into the line and got the firing stopped. It then appeared that the covering party, having made a circle of some haystacks, had lain down facing the wrong way, had mistaken the working party for approaching enemy and run back the way they had come to give the alarm. However, luckily, an estimated expenditure of some 10,000 rounds by both sides only produced one slight casualty. The work was then carried out successfully.

"Keeps" were constructed in Givenchy, and mines laid for electrical firing from the keeps. On one occasion, Mallins went out with some London Scottish Scouts and blew up an inconvenient house in front of the line.

Amongst other works carried out during the period were the construction of a heavy timber dam at the lock gates, which the Germans constantly endeavoured to damage by gun fire; the commencement of offensive mining, unfortunately stopped by the German attack of January 25th, which captured our mining party including Corpl. A. B. Smith and two men; bomb-making and the construction of an O.P. in the factory at Cuinchy.

There were two battle periods. Early in January, the Germans, by heavy trench mortar fire, wiped out the front line defences on and near the railway embankment at which point our line was inconveniently close to the railway triangle. The enemy then installed himself on the embankment and on a somewhat defiladed hummock, 200 yards nearer our lines. From this vantage point, and assisted by bushes growing alongside the line, snipers made things most uncomfortable over the whole brickfield area. An early counter-attack by the Scots Guards was unable to hold its ground, the exposed embankment being an absolute death-trap. On January 10th, a more deliberate attack was carried out after a preliminary bombardment, by five parties of the K.R.R., each of an officer and ten men, and one officer and ten men of No. 2 Section, 23rd (Field) Co. At 2 p.m., the attack commenced. The two parties of K.R.R., who made for the forward post (point A in Sketch No. 10), were wiped out almost immediately, one wounded officer making his way back along the line. The third party and the R.E. making for the hummock (point B), were more successful, captured several prisoners, and although attempts to cross the line drew heavy machine-gun fire, the infantry, whose officer had become a casualty, lay in the shelter of the hummock in a position whence they could fire up the line. Two sappers were seriously wounded trying to get across the line, one dying of wounds that night. Lce.-Cpl. Lee, R.E., and one or two more sappers, very gallantly got these men back into shelter, and the work of consolidation commenced. For his gallantry and splendid example on this occasion, Lce.-Cpl. Lee received the

D.C.M. Stafford's section had, meantime, pushed its way along a water-logged old trench leading to the embankment and commenced to pass sandbags full of brick to No. 2 Section, some of whom had also started to dig in from the shelter of the hummock. A half-hearted counter-attack along the embankment was driven off by rifle fire. In the meantime, the two remaining parties of K.R.R. had started forward along the foot of the embankment towards the captured post, but were caught by a machine-gun and practically wiped out.

However, the brick wall was rapidly pushed out, one or two sappers wriggled across the line and established themselves in a post amongst the bushes on the far side, commencing to dig from that side. By dark a good trench had been dug right across, some wire had been put up and the post was fairly well established.

Mallins (No. 4 Section) and two Sections, 1/1 Lowland Field Company, R.E., relieved Nos. 2 and 3 Sections in the work of consolidation about 6 p.m. The Lowland Field Company had just arrived and this was their first introduction to front-line work. The occasion was marked by an excellent bit of work by Lieut. Clarke and his Territorial Sappers.

As they were arriving at the head of the Sapper party, and were still some 200 yards from the embankment, the outline of which could just be seen against the star-lit sky, one or two well-directed trench mortar bombs dispersed the small infantry garrison with several casualties, and it appeared that a counter-attack was in progress. Lieut. Clarke at once fixed bayonets and led his men forward at the double, establishing themselves on the post, and dealing effectively with the small German party that was endeavouring to push along the line. For a first appearance in the battle area, this was a fine effort, and was a measure of the high standard from which our Lowland friends never afterwards fell away.

It but remains to add that a few nights later this post was once again heavily trench-mortared, and this time the enemy regained possession. It was then decided to leave ill alone and to construct a switch trench facing the embankment. As this was a somewhat ticklish job, it was decided to carry it out with R.E. labour only, and, on a dark night, Nos. 1 and 2 Sections moved out in file on a compass-bearing from the existing front line, both Sections on a long tape knotted at 15 and 6 feet intervals, one man per knot. The distance had been correctly estimated and the trench was dug with success, to a depth of 3 feet, giving thus the normal 4 ft. 6 ins. cover, with 6 ft. traverses. It will be seen that each pair of men had one fire bay and one traverse to construct, about 240 cubic feet for each pair. This task was carried out in five hours, a good bit of work.

On January 25th, the great Kaiser's birthday attack took place.

After overrunning the front line the enemy bumped into the brick keep, which was a complete surprise, and, garrisoned by a company of the Loyal North Lancs, completely held up the enemy's advance. Later on, a determined attack was made on the keep which entirely failed, an attack described to the writer by an infantry serjeant who was in the keep, with tears of laughter running down his cheeks. The enemy apparently brought mattresses and pillows, chairs and step-ladders into the fray to help in climbing the solid walls, and a very queer array it must have looked.

Between the keep and the embankment they pushed through into a pocket, but counter-attacks by the 1st Guards Brigade drove them back, and the line finally stabilized for the rest of the War a couple of hundred yards or more in front of the keep. The Company bricklayers had every right to be satisfied with their handiwork.

The reorganization of the defences meant a good deal of work for the Company. A new "keep" was commenced about an orchard behind the right of the line, and a small railway triangle on the left was also strongly fortified. This point was the scene of heavy fighting on January 25th and following days, but the enemy had eventually to be satisfied with our old post B. In this affair, Parkes was slightly wounded in the head but remained at duty.

On February 2nd, the Company was relieved by the 11th (Field) Company and moved off on the 3rd to billets at Hurionville, not, however, without another catastrophe similar to that at Ypres in November, a shell bursting in the billet killing 2 and wounding 15 men. Last nights in billets began to be looked on with suspicion.

The period of rest, February 3rd/27th, was marred by a serious bombing accident in which Maj. Murray, a fine soldier, in the Black Watch, who had that day returned from England after having been wounded on the Aisne, was killed, and also a serjeant of the battalion, whilst Herring was desperately wounded, and evacuated to England. On February 22nd, Capt. E. F. S. Dawson joined as 2nd in Command.

On the 10th February, the Company received a recognition of all its strenuous efforts in the award of a D.S.O. (Lieut. R. L. Bond).

It is interesting to note that on February 11th an instruction was received that the standard fire trench was to consist of 18-foot bays, with traverses 6 by 4 feet.

On February 24th, 1 officer and 50 men (miners by trade) from the Gloucesters and Royal Welch Fusiliers joined to form a special mining section.

On February 28th, the Company moved to the old Sapper and Miner billets at Le Touret, which they were to occupy until after the unhappy attack of May 9th.

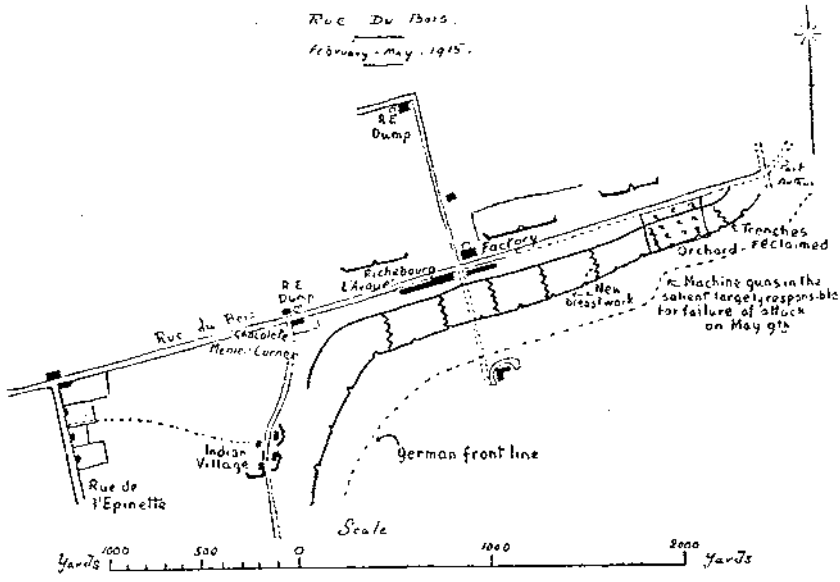
The work with which the Company was now faced was quite a new problem. The sector for which it was responsible was in the main the portion running parallel to the Rue du Bois, at one time

taking in Indian village on the right, at another extending almost to Port Arthur on the left. (Sketch No. 12.)

After the Christmas battle, both sides had settled down in misery in the water-logged trenches, but these became quite untenable, the water level being but a foot or foot-and-a-half below ground. The only possible shelter was breastworks. Our troops withdrew two or three hundred yards and lived in discomfort behind one inadequate line of breastworks, this being the state of affairs when the 1st Division took over the sector. The following months until May 9th were spent in a ceaseless effort to make the line defensible.

The first efforts were directed to strengthening keeps at Indian

SKETCH No. 12.



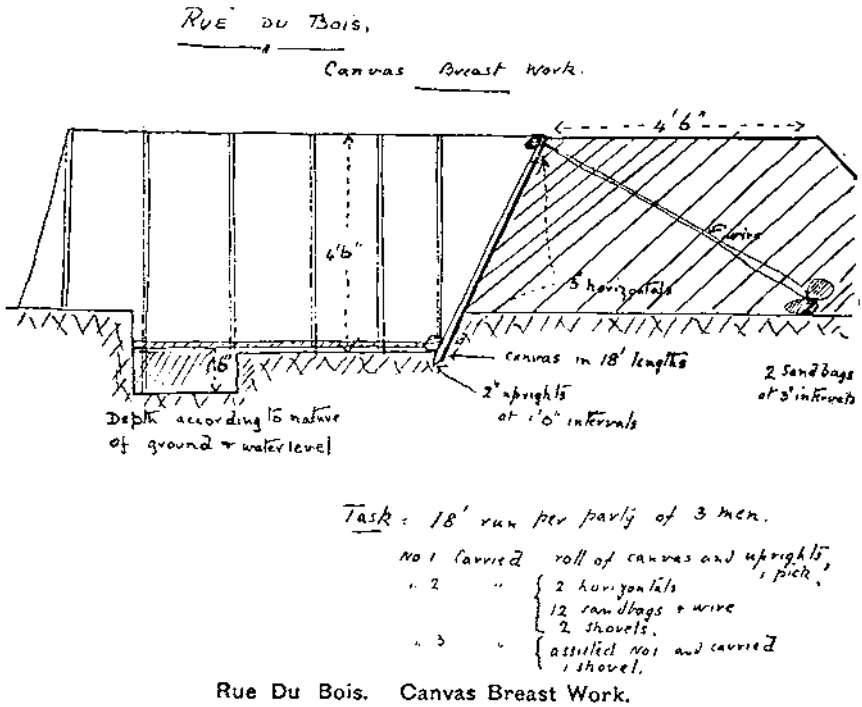
Rue Du Bois. February—May, 1915.

village, Chocolat Menier Corner, and the orchard. Then followed a great work, the reconstruction of the front line on the site of the old front trench. It was considered inadvisable to use working parties so close to the enemy, and this front line for a length of 1,500 yards was almost entirely constructed by the sappers. Complete silence and careful organization was necessary. The breastwork was, therefore, constructed as follows (see Sketch No. 13). Revetment of canvas was used in 18-foot lengths, *i.e.*, 18-foot bays, 6 by 6-feet traverses. Each length of 18 feet was made up complete with pickets. Each picket was held fast by sandbags tied to wire and buried under the parapet. Three men worked on each 18-foot length and carried their own stores, so that laying out was automatic. This system worked well, and each night a section of 30 men, the

average working strength, completed five 18-foot bays with traverses. The work could not be made continuous, for the enemy soon spotted what was going on, and the flanks of completed works were unhealthy, so that eventually a long series of bays grew up, joined eventually as the situation allowed.

Once the front line was complete, it was possible to use infantry working parties on a great scale, and a very interesting time this was. Not only were there thousands of yards of communication trench breastworks to be constructed, but two series of reserve line breastworks were also required, partly with a view to the forthcoming

SKETCH No. 13.



Rue Du Bois. Canvas Breast Work.

attack. In addition, parados had also to be constructed. Every night, therefore, each sapper section (the Company worked two sections forward each night and two in billets preparing hurdles, knife-rest obstacles and so on) had some 600 infantry to handle. These were divided into four carrying parties of 50 apiece, and four working parties. The carrying parties drew hurdles from two separate dumps, and carried them to the various sites. The sappers provided sandbags and wire. Hard on the heels of the carrying parties came the digging parties. To each party a small number of sappers were allotted to do the anchoring of the hurdle revetment, and so on. As each section had parties working over an area, 1,000 yards or more long by 500 yards deep, it will be obvious that the

guiding and R.E. supervision devolved almost entirely on the junior N.C.Os. and even sappers. That the whole work went without a hitch, the timing of the arrival of the parties being invariably excellent, is a remarkable tribute to the high standard of efficiency and self-reliance of these junior N.C.Os. and sappers. Nothing brought out more clearly what magnificent fellows the rank and file were than their handling of these rather intricate working parties.

The 23rd (Field) Company's only difficulty was to get off ahead of our friends the Lowlands each night. The latter lived half-a-mile further up the road, they had an unique gift for the construction of barbed wire knife-rests on the mass production system, and had these excellent obstacles carried out by large parties of strong men nightly. Sometimes the strong men tired of their burdens, when other users of the road would find an impenetrable block anything up to half-a-mile long, impervious to the most finished vituperator.

On March 31st, 2nd-Lieut. B. B. Edwards joined the Company *vice* Lieut. Parkes (to hospital).

This long spell of work culminated in the abortive attack of May 9th. No ground was gained, and the 23rd (Field) Company and its attached working parties, waiting to go forward and consolidate, suffered severe casualties from shell fire in the concentration trenches.

After this the 1st Division was withdrawn, going into the line again south of the La Bassée Road at Cambrin. Here new trenches were taken over from the French, in pretty good condition. A cup of excellent coffee was taken with some hospitable French sappers in the Maison Rouge dump on handing over. Mining and countermining were just commencing, making life somewhat uncertain in the line, but on the whole the sector was peaceful, the line well established, and after getting rid of the remains of the winter's mud, the work of constructing "keeps" was taken in hand on a well-thought-out principle.

These "keeps" or strong points were constructed for all-round defence, some 400 yards in rear of the front line, each "keep" intended for a garrison of from one to two platoons, and fitting in as far as possible with the existing trenches so as not to be too conspicuous.

On May 27th, Lieut. Bond was evacuated sick to England, 2nd-Lieut. Salmon joining on June 1st.

On June 1st, the Company withdrew to rest billets at Raimbert.

On June 23rd, in *The Birthday Honours Gazette*, the following awards to officers and N.C.Os. were published :—

Maj. C. Russell-Brown to Brevet Lt.-Col.
Capt. H. W. Herring, awarded Military Cross.
Lieut. J. H. Stafford, awarded Military Cross.
2nd-Lieut. A. J. Parkes, awarded Military Cross.
C.Q.M.S. Griffin, awarded D.C.M.
2nd-Cpl. Milne, awarded D.C.M.

On June 28th, the Company once more returned to work in the line, this time in the sector to the south of their previous area. Company billets were at Labourse, two sections forward in Vermelles.

Although fighting took place constantly in the Ypres area, the front, south of the La Bassée Canal, now developed into the comparative peace of an inactive line, only to be rudely broken by the Battle of Loos.

The trench system, by the end of June, was fairly well developed, though defences were still based entirely on the rigid defence of the front line system, closely supported by a series of keeps.

The old hand-to-mouth work, resulting from the continuous fighting of 1914 and the early months of 1915, now gave place to a systematic building-up of the defences, and pre-arranged programmes with a system of daily progress reports on the model of ordinary peace construction work, into which it is not possible to go in detail. Suffice it to say that the Field Companies were now employed in the main on their true duties of more technical work in connection with bomb-proof cover, machine-gun emplacements and the construction of keeps, on a programme laid down by the General Staff of the Division. (A typical programme is given in Appendix B.) It will be admitted that this is a fairly comprehensive list. The attached mining section was, of course, invaluable in the construction of "bomb-proofs," as deep dug-outs were then called.

It should be remembered that the area in which all this work was in progress had a chalk subsoil.

On July 22nd, Lieut. Stafford left the Company for 1st Army H.Q. to take up appointment as Staff Officer to Chief Engineer, being replaced on July 23rd by 2nd-Lieut. W. R. Wilson, R.E. (Temporary Commission), who was later for so long to command the Company with distinction.

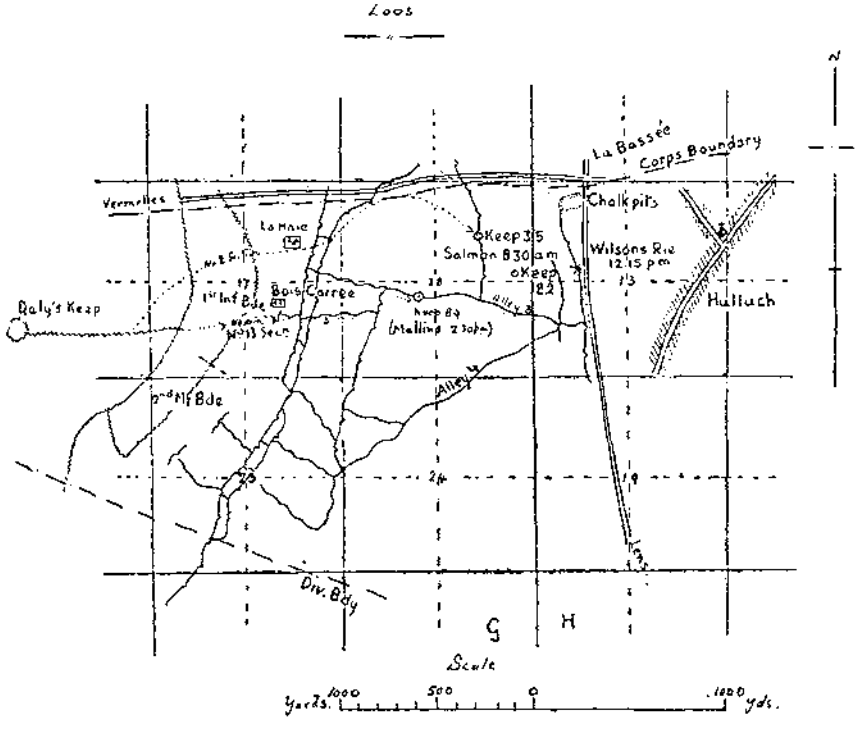
The battle of Loos took place on September 25th. For some time prior to the battle, the 23rd (Field) Company had been employed on work in preparation for the battle; widening communication trenches, making additional dug-out accommodation, spitlocking proposed forward routes and making recesses in the front line, eventually intended to hold gas cylinders. Sketch No. 14 shows the area in which the Company was employed, and points mentioned in the narrative.

The four sections moved to their battle stations on the evening of the 24th, No. 1 Section (Lieut. Edwards, 29 N.C.Os. and men), No. 2 Section (Lieut. Salmon, 28 N.C.Os. and men), No. 3 Section (Lieut. Mallins, 32 N.C.Os. and men), No. 4 Section (2nd-Lieut. Wilson, 27 N.C.Os. and men). In addition, the attached infantry mining sections were available as working parties, together with special infantry wiring parties.

Nos. 1 and 4 Sections moved partly to specially selected dug-outs

in the support line, partly into the front line, No. 1 on the right, No. 4 on the left. The men in the front line assisted the 187th Company, R.E., to place the gas cylinders in the special recesses. The gas was released at 5.50 a.m., and after rolling forward a short distance, began to drift back into the front trench. Lieut. Edwards and some 10 men were gassed, of whom Edwards and 3 men were so bad that they were unable to carry on, and had eventually to return to Vermelles. 2nd-Lieut. Wilson took charge of Nos. 1 and 4 Sections, and whilst waiting for orders to move forward, assisted in

SKETCH No. 14.



The Battle of Loos.

clearing the front line of dead and wounded. Eventually at 10.30 a.m., Wilson received a verbal order from Col. Russell-Brown, who had established Co. H.Q. in Daly's Passage: "Move forward into Hulluch and consolidate the position." This, no doubt, was the result of the following message received shortly before this from 1st Infantry Brigade: "Hulluch has been taken. Push up 2nd working party to follow the Black Watch . . . on southern border of Hulluch."

Nos. 1 and 4 Sections commenced their advance, with three infantry working and wiring parties each under an officer, at 11 a.m.

We must now turn to Nos. 2 and 3 Sections, who were detailed to follow the assaulting troops. Both Sections moved out of the communication trench (Daly's Passage) about 7.20 a.m. and moved across country to our support line. No. 3 Section, followed by the Black Watch platoon (working party), on the right, had casualties during this movement and again in the further advance to a German T-head south of Bois Carrée, at which point the enemy's fire was heavy from front and right flank, and it appeared that the German front line was still occupied. In gallant efforts to cut the wire in front of this trench, Lce.-Corpl. Pridham was severely wounded, but Mallins followed by the remains of his Section, only 10 strong, and Lieut. McLeod and 20 Black Watch (out of 45), got into the T-head from which no advance was possible till 1.30 p.m., when Mallins led his parties forward, first to a German third line, and finally to the spot originally selected for a keep at G18 c89 (keep 89), whence Salmon's party at G18 b3.5, was visible. The party was just getting to work when a sharp outburst of fire wounded Mallins and a sapper severely. Mallins, at 3.15, had to hand over to Lieut. Wilson, who had now arrived.

No. 2 Section, on the left, having made for the Haie, at once met a party of Camerons and Berkshires moving quite steadily in the direction of our lines, having apparently completely lost direction in the fog and gas. Salmon turned them about, and an officer of the Camerons appearing and taking charge, the infantry at once went as steadily forward. Salmon waited till they were clear and then moved forward over the German front and support lines, subsequently getting into a communication trench, as casualties were being caused by rifle fire from the right. This Section, together with Lieut. Lumsden and the Black Watch working party, reached its objective at G18 b35 (keep 35), at 8.30 a.m., and at once commenced work on the strong point in spite of rifle fire from the front and left flank.

At 11 a.m., 2nd-Lieut. Wilson, with Nos. 1 and 4 Sections, as already stated, together with working parties (Lieut. Sparkes and wirers, Lieut. Mayne and 32 South Wales Borderers and Glosters and 20 Black Watch) moved out in extended order, passed south of the Haie, and having received several casualties from rifle fire from the right flank, got into the main German communication trench.

Corpl. Butler, gallantly trying to get a wounded sapper into the trench, was severely wounded but refused to be attended to, ordering Corpl. Milne, D.C.M., who tried to get him under cover, to go on. The R.E. casualties here numbered eight.

At 11.30 a.m. the whole party joined up with Salmon (No. 2 Section) at keep 35, and commenced work on the keep and fire-stepping trenches leading into it.

2nd-Lieut. Wilson, who had been ordered originally to proceed to

Hulluch, now went forward to reconnoitre with a view to carrying out these orders, getting as far as a tunnel under the main road, about H13 a5.1, whence Wilson and an officer of the S.W.B. saw movement, apparently enemy, about chalk pits to the north. There appeared to be no British troops in Hulluch, so Wilson withdrew to keep 35.

At 3.15 p.m., touch was eventually established with the wounded Mallins, at keep 89. Steps were taken to commence joining up keeps 35 and 89 by a fire trench, and Mallins then withdrew. This work continued during the whole night of the 25th/26th. A German counter-attack against a trench running out from keep 35 was beaten off by the S.W.B.

About 8.30 p.m., on the 25th, the O.C. 23rd (Field) Co. arrived and organized the working parties as garrison of the keeps and intervening trench under the respective infantry officers.

R.E. and infantry stood to arms at 4 a.m. on the 26th.

Heavy and accurate shrapnel fire was experienced from the north during the morning, making work impossible. At 10.50, Capt. Campbell, Black Watch, in charge of keep 89, received orders to take his platoons and attack Hulluch, leaving the R.E. and attached miners only as garrison of the keeps, with Wilson and Salmon in charge. A big German counter-attack was seen in progress between Bois Hugo and Hulluch, but Campbell moved out at 11.5, under the continual shrapnel fire against Hulluch.

Through some error, the greater part of Lieut. Salmon's two sections withdrew from keep 35 about midday, a verbal order, the genesis of which was never explained, having been received for the R.E. " to pass out." Wilson, on discovering this, made every effort to get back the missing men, and eventually, thanks to the assistance of an officer of the mining sections, who was dissatisfied with the situation and returned to keep 35, all the sappers were brought back and work was commenced again on the defences at dusk.

In accordance with instructions from Gen. Ready (Cmdg. 1st Infantry Brigade), who arrived at keep 35 during the evening, Wilson and Salmon commenced work on a new keep, " 52," though actually nearer "82," and on connections from this keep to 89. The Brigade Commander was much amused at the story of the afternoon's " retirement," which had apparently caused consternation and alarm to one of the infantry subalterns, who had been offering to shoot some of the offenders with his revolver.

At 2 a.m. the O.C. arrived with rations, and shortly before daylight all sections withdrew to Vermelles.

The casualties in this battle were 1 officer wounded and evacuated, 1 officer gassed, remained at duty, and 42 other ranks killed, wounded or missing. Amongst those who died of wounds was Corpl. Nunn, a fine N.C.O., who will be well remembered by officers who served at

Aldershot in pre-War days as a first-rate cricketer and footballer, and a rare good fellow. He was a great loss to the Company. He was awarded the D.C.M. for his gallant example on this day.

On the 29th and 30th, the Company withdrew from the line.

APPENDIX B.

PROGRAMMES OF WORK LAID DOWN BY H.Q. 1ST DIVISION.

A. *Work to be carried out by infantry.*

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B. *Work to be carried out by Royal Engineers.*

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Y Section. (Note:—This was Section for which 23rd (Field) Company, R.E., was responsible.)

5(*a*) Bombproofs behind support line throughout, in proportion of one to approximately every 16 yards.
(*b*) Complete Chapel keep.
(*c*) Complete Bn. H.Q. in Y3.
(*d*) Complete blinded gaps towards Hohenzollern Fort.
(*e*) Complete Daly's keep.
(*f*) Put Le Rutoire Farm in a state of defence.
(*g*) Construction of Junction keep.
(*h*) Complete Central keep.
(*i*) Complete Le Rutoire keep.
(*j*) Continue boring for water in Y2 Section.
(*k*) Complete Hulluch Road keep.
(*l*) Construct small keep on railway near well to block railway communication trench.
(*m*) Complete tram lines to Fosseway.
(*n*) Provide water storage in all keeps.

APPENDIX C.

NOTES ON FIELD DEFENCES IN THE VERMELLES SECTOR, JUNE–AUGUST, 1915.

1. *Keeps.*

A considerable number of keeps were constructed, each for a garrison of about a platoon. These keeps were circular enclosed works, usually placed at trench junctions, surrounded by wire entanglements. Dug-outs were provided for the garrison, and the

portions of existing trenches leading into the keep were straightened and provided with bombing blocks.

These works were naturally peculiarly visible from the air, particularly in this chalky soil, and were aptly endowed with a title of agricultural origin, owing to their resemblance to certain pastural phenomena.

2. *Concrete and tunnelled dug-outs.*

(*a*) About this time the 23rd (Field) Company constructed what must have been practically the earliest concrete dug-outs used by the British Army.

Constructed just north of the Vermelles-Hulluch Road, each dug-out was of the " cut and cover " type, with a 3-foot concrete roof reinforced with I-beams from the Vermelles brewery.

(*b*) Tunnelled dug-outs, looked on with great suspicion by the staff, were commenced. They were not allowed in the front line, and entrances had to be made under the parados of the second line. They had but 6 to 8 ft. of cover at first, but, a test being carried out by burying a 6-in. howitzer shell 18 ins. deep over the top and firing electrically, this was found to be insufficient and was increased to 8 to 10 ft. 3-in. timbering was used instead of 1½-in. and these dug-outs were then pronounced proof against 5.9 in.

A Norton tube well was installed in one of these dug-outs.

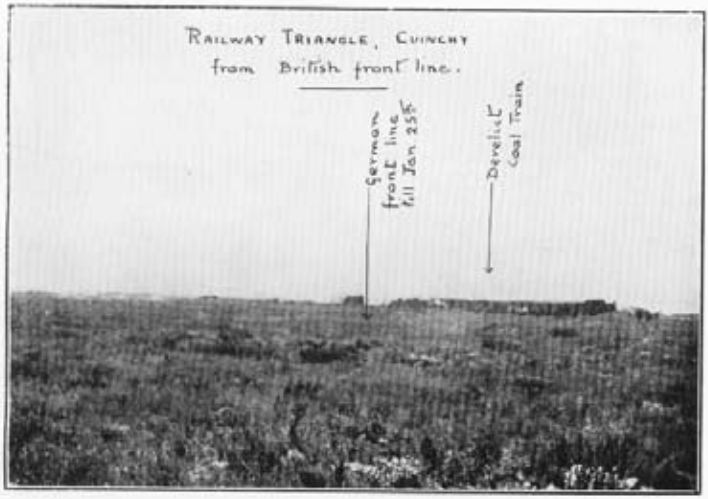
(*To be continued.*)

HISTORY OF THE 23rd (FIELD) COMPANY, R.E., IN THE GREAT WAR 1914–18. *PART I.*

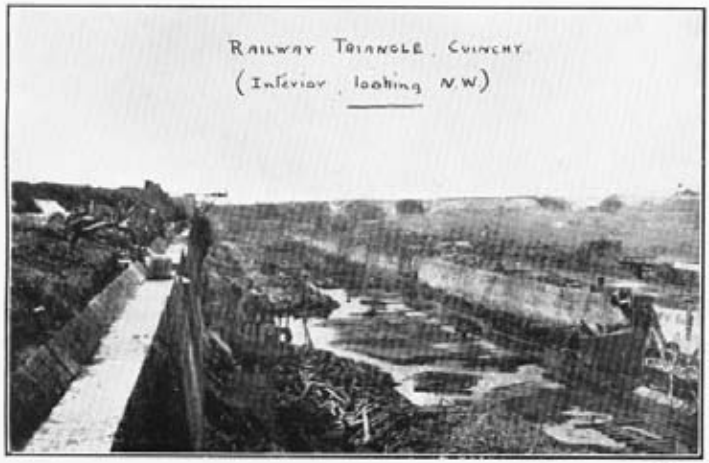
ADDENDUM.

Appendix A. (*R.E. Journal*, June, 1928, page 218.) Order of Battle. Mounted Section Serjeant. After *Serjeant Rapson* add: " Serjeant Rapson was promoted to C.Q.M.S. and left the Company on August 13th, his place being taken by Serjeant A. Ives, who took the Section overseas."

THE 23rd (FIELD) COMPANY, R.E., IN THE GREAT WAR, 1914–1918.

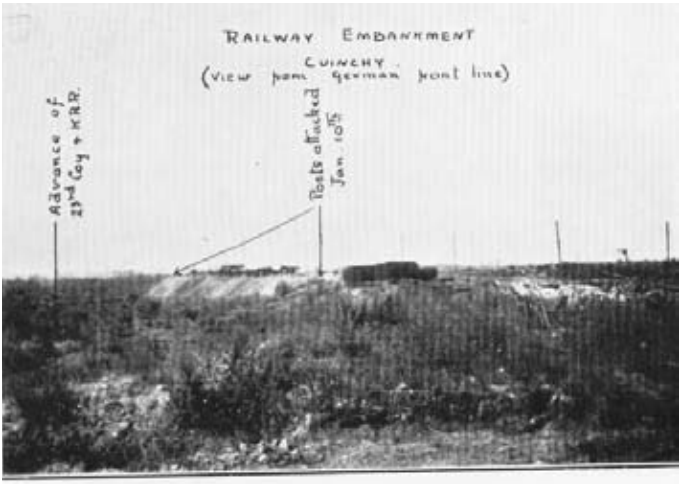


Railway Triangle, Cuinchy, from British Front Line.

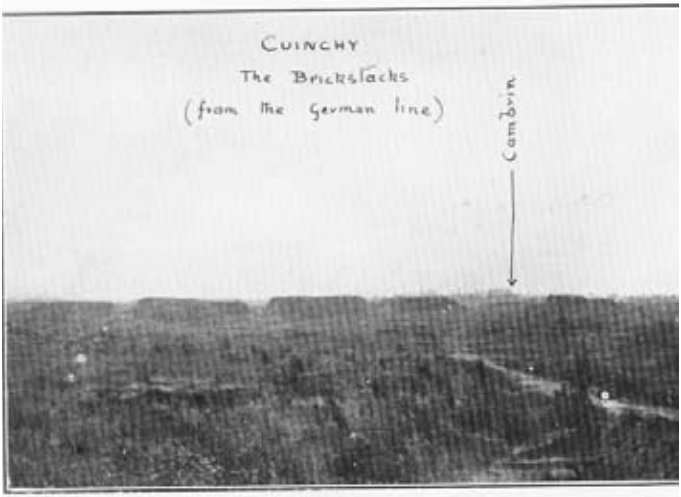


Railway Triangle, Cuinchy (Interior, looking N.W.).

RailwayTriangle



Railway Embankment, Cuinchy (View from German Front Line).



Cuinchy. The Brickstacks (from the German Front Line).

Railway Triangle 2

DIPLOMACY, OR THE CONDUCT OF FOREIGN AFFAIRS.

A Lecture delivered at the S.M.E., Chatham, on October 18th, 1928, *by* WICKHAM STEED, Esq.

OUR subject this evening sends back my thoughts to the end of January, 1914, when I was invited to address the Royal Institution of Great Britain upon "The Foundations of Diplomacy." In those venerable precincts, devoted to the dissemination of scientific and "useful" knowledge but from which politics are rigorously excluded, it was almost unprecedented that a speaker should deal with a subject so nearly akin to politics as diplomacy. Yet I claimed that knowledge, useful and otherwise, was essential to the successful conduct of foreign affairs, and that the true foundation of diplomacy was "living knowledge in the service of an ideal." To-night, as General Walker kindly reminded me when he asked me to give this lecture, the standpoint from which diplomacy has to be considered is somewhat different. "Diplomacy," he wrote, "is always an absorbingly interesting subject, but in the normal course of events the soldier seldom has to handle it, and usually we know little about the delicacy by which diplomatic results are arrived at. When, however, the soldier is called in, it is difficult for him to give the really soundest military advice unless he is up-to-date and clearly sees what the country wants and how force could and should be used."

Here, it seems to me, we have a link between my address to the Royal Institution in January, 1914, and what I shall try to say to-night. If a soldier cannot give the soundest military advice "unless he is up-to-date," it follows that, in order to be up-to-date, he should possess as much knowledge as possible. This is another way of saying that knowledge is the corner-stone alike of good diplomacy and of good military advice.

Before delving into our subject, an instance of successful diplomacy on the part of a soldier occurs to me. Late in 1896 or early in 1897, the famous French military explorer, Colonel Marchand, was sent across Africa to explore, and to claim for France, the regions surrounding the upper reaches of the White and Blue Niles and to effect a territorial junction between the African possessions of France and Abyssinia. The object of France was—as her Foreign Minister, M. Hanotaux, confessed to me in January, 1897—to obtain control of the upper waters of the Nile so as to render untenable the British position in Egypt if England should persist in her campaign for the reconquest of the Soudan. But, by the time Colonel Marchand reached the White Nile, he found General Sir Herbert Kitchener awaiting him with a considerable force at Fashoda, now better

known as Kodok. The circumstances were painful. Marchand had orders to go on. Kitchener had orders to stop him. Marchand had tramped thousands of miles through forest and swamp, and his escort was wholly unable to stand up to Kitchener's troops, without counting the armed steamer in which Kitchener had advanced. To have captured or to have annihilated the French force would have meant war between France and England. The British Fleet was ready for action, and the whole question was whether the French Government would accept the humiliation of seeing its design thwarted despite its representative's heroic effort. Kitchener sympathized with Marchand's position, but found him, not unnaturally, disinclined to give way. By a stroke of genius he eased the tension with a fine diplomatic phrase—" Come and have a drink."

The sequel is known to you. M. Delcassé, who, as Minister of the Colonies, had been directly responsible for sending Marchand on his mission, but who had afterwards succeeded M. Hanotaux as Foreign Minister, had the courage to recognize the mistake that had been made, and to bow to the inevitable. He yielded. Marchand was ordered to withdraw. Out of that withdrawal came improved relations between Great Britain and France which led, first, to the Anglo-French agreement of 1899 in regard to Northern Africa, and, five years later, to the Anglo-French Entente of 1904. I often wonder what the position of this country and of the British Empire would have been to-day if Kitchener had lost his head at Fashoda and had fired upon Marchand's men instead of offering their leader a drink. We should probably have had France and Germany actively against us when the South African War broke out in October, 1899, and we should certainly have found the French on the German side whenever the Kaiser might have thought " The Day " had dawned for him to strike his long premeditated blow at England.

In those days, I was living in Rome as correspondent of *The Times*. It was my privilege to be treated as a friend by one of the wisest statesmen and diplomatists I have ever known, the Marquis Visconti Venosta, who was Foreign Minister of Italy. He had been in his youth a disciple and a lieutenant of Cavour, the greatest statesman of modern Italy; and, in the early 'seventies, he had more than once measured himself with Bismarck, not to Bismarck's advantage. From him I learned whatever I may claim to know of the principles of diplomacy, and of the proper conduct of foreign affairs. My subsequent experience, which has been varied, served to confirm the accuracy of his vision and the soundness of his principles. He it was who told me, in September, 1902, before I left Italy to take up my residence in Austria-Hungary, that he saw a great European War coming within ten, or, at most, fifteen years. " The aggressive character of German policy," he said, " will compel England to fight unless she is prepared to forfeit her place in the world." He could think of but one way of preventing this catastrophe—by creating a

really close understanding between Italy and Austria-Hungary so that, by acting together as members of the Triple Alliance, they could jointly put a check upon German aggression. He added that no Italian Ambassador could explain this to the Austrians, for it would be too dangerous. But he thought I, as an unofficial person who knew Italy, and was about to go to Vienna, might do it in the responsible exercise of my profession.

I did my best—and failed. Failure was not perhaps due altogether to my own shortcomings, and was certainly not attributable to lack of understanding on the part of some leading Austro-Hungarian statesmen. The trouble was that Germany did not wish Austria-Hungary and Italy to agree, and that, as soon as Count Goluchowski, the Austro-Hungarian Foreign Minister, had begun to work for a good understanding with Italy, the German Emperor "torpedoed" his position; and, further, that, by the time Goluchowski's successor, Count Aehrenthal, had learned the lie of the land, Germany had established so firm a hold over Austria-Hungary, that nothing could be done.

This is all ancient history that may seem to have little more than an episodical bearing upon our subject to-night. Yet there runs a thread of continuity between those days and the present. Partly under German influence, partly with the desire to assert their independence of Germany by mistaken methods, Austro-Hungarian soldiers and politicians conceived the idea of establishing Hapsburg rule over the Western Balkans by crushing the Kingdom of Serbia and by incorporating it in the Hapsburg realms. Now the Kingdom of Serbia was the chief independent centre of the Southern Slav race, the majority of whose members were subjects of the Hapsburg Crown. Their chief leaders dreamt of unity and independence. Some of them looked to Serbia for help. This Southern Slav unitary movement was obviously a danger to Austria-Hungary. It might have been avoided by a wise policy that would have drawn Serbia into close agreement with Austria-Hungary in such a way as to accomplish Southern Slav unity under Hapsburg auspices. But the advisers of the Emperor Francis Joseph were not wise. They lacked knowledge of the true conditions in the Southern Slav world, and they believed whole-heartedly in the doctrine of force. They were not up-to-date. When, in 1912, Serbia joined Greece and Bulgaria in a war of liberation against the Turks, the Austrians rubbed their hands, for they were persuaded that the Turks would make mincemeat of the Serbians, and that Austria-Hungary would then be able to extend a greedy, albeit an ostensibly protecting hand over the Southern Slav Kingdom, and to secure it for herself. But the Serbians actually had the audacity to defeat the Turks. They marched, moreover, across the Albanian mountains in mid-winter to the Adriatic shore at Durazzo, despite a threat that the Austro-Hungarian fleet would bombard them if they dared to reach the

coast. At that moment, I wrote from Vienna to an important personage in London saying that if the Austro-Hungarian fleet should bombard the Serbians at Durazzo, England would have to land an army in Belgium within ten days. The reply I received from London was typical. "How are people in England," it ran, "and still more in the Oversea Dominions, to be made to understand that we can possibly have any interest in the destiny of this or that Albanian village of whose very existence most of us were, until yesterday, unaware? We can only fight for clearly defined British Imperial interests."

I will only indicate the tenor of my rejoinder—as I indicated it in my address to the Royal Institution on January 30th, 1914. It was to the effect that an Austrian attack upon the Serbians would inevitably bring on Russian intervention in favour of Serbia; that Germany would then support Austria-Hungary, while France would support Russia. Germany would at once bolt into Belgium and endeavour to seize the mouth of the Scheldt and even Calais, with a view to their conversion into anti-British naval bases. Would these developments, I asked, affect no clearly defined British Imperial interests?

Let me quote one other passage from my address to the Royal Institution:

> "More by luck than by skill Europe then escaped the worst of the dangers that threatened her. By dint of changing their policies with bewildering rapidity, the Great Powers managed to march, with imperfect alignment, not abreast but in the rear of events. When they sought to regain control and leadership, the uninformed diplomacy of some of them sanctioned expedi ents which were, in the summer of 1913, again to plunge South Eastern Europe into a sea of blood. Diplomacy has rarely suffered defeats more discreditable than those of 1912–1913. It failed to prevent, by timely action, the first Balkan War. It failed to prevent the resumption of that War. It sanctioned arrangements that made the second Balkan War inevitable; and its only title to honour was that it succeeded, by muddling along the line of least resistance, in staving off a European conflagration."

This, remember, I said on January 30th, 1914. Exactly six months later, Austria-Hungary attacked Serbia by way of seeking reparation for the murder of the Archduke Francis Ferdinand and of his consort at Sarajevo on June 28th. The Great War had begun. Its immediate cause lay in the persistent Austro-Hungarian misreading of the Southern Slav question, while its general cause lay in the aggressive designs which the German Emperor and his General Staff had long cherished.

During the past year it has been my painful duty to read many of the fifty odd volumes of the German Diplomatic Documents that bear on this period. Those volumes were issued by the German Foreign Office with the object of proving that Germany was not guilty of the War, or, at any rate, not more guilty than other Powers. I admit that one effect of those volumes on my own mind has been to make me revise my former estimate of German guilt. Where I had imagined there to have been a settled, co-ordinated, scientific plan, in the execution of which German diplomatists and German soldiers were working like a well-constructed and well-oiled machine, I found that there was in reality a degree of incoherence, ignorance and uncertainty that would be almost comic had not its consequences been so unspeakably tragic. Germany, for all her planning, all her forethought, all her intrigue, blundered into the War. Neither her statesmen nor her soldiers knew what they were doing. Their objects were undoubtedly guilty, as we reckon guilt to-day, though less guilty if we accept Clausewitz's conception that war is a way of attaining political ends by other means, and that its use is legitimate for the furtherance of national interests. In the light of such a conception there is only one test of guilt or innocence in war—the test of success or failure. Judged by this test, Germany was guilty in the Great War because she failed.

Is there no other test to-day? As Mr. J. A. Spender has written in his *Life, Journalism, and Politics*:

> "No one claims credit for having planned or forced on the Great War; the victors are as much concerned as the vanquished to prove that the blame was on the other side. We now habitually speak of 'war guilt' as the greatest of public crimes, and have almost persuaded ourselves that we have always thought of war in this way.
>
> "This, it seems to me, is an illusion which we ought not to pass on to those who come after. The Great War arose out of a state of opinion which regarded war as a legitimate and normal method of promoting national interests; and to prevent opinion from slipping back into that atmosphere is perhaps the greatest task before the coming generation. . . . The truth is that, in the world in which we were brought up, the crime was not to make war but to make it unsuccessfully, and so it had been from the beginning of time. . . In my early days, Bismarck stood on the highest pedestal among nation-makers and Empire-builders, and he acknowledged that he had welded the German Empire with blood and iron in a series of carefully-planned wars. Frenchmen deplored the balance of forces which made it seemingly impossible for them to recover the lost Provinces, but few of them would have thought it a crime to wage war for their recovery, if there had been a reasonable chance of its being waged successfully.

> "Nor can it honestly be said that we British held a different view. We considered ourselves to be pacific, but, as our neighbours pointed out, we had been more frequently at war than any of them, and the possibility of war entered into the calculations of both our political parties. . . . We might debate angrily about the sufficiency of the cause, but we never denied that, if the cause was sufficient, war was the legitimate *ultima ratio*, and not merely for the defence of territory but also for what we conceived to be the interests of the British Empire or the resentment of injuries to it."

You may ask: What have views about the legitimacy of war to do with diplomacy or the conduct of foreign policy? My answer is: "Everything." "A diplomatist," said a British diplomatist who was famous at the beginning of last century, "is a man sent abroad to tell lies for the good of his country." In this definition there was much cynical truth, inasmuch as foreign affairs have in the past usually been conducted in a rarified moral atmosphere, not to say an ethical vacuum, in which ordinary notions of right and wrong, truth and untruth, lose much of their force. There were, and are, unwritten rules and traditions that regulate the practice of diplomacy. A downright official lie is thought to be bad form, especially when it is found out; then, a dozen diplomatists may indignantly exclaim, "One really ought not to lie like that." Blundering falsehood has been frowned upon, less because it was falsehood than because it was blundering. The difference between a supremely expert and a less expert diplomatist might often be defined in the terms of the comparison once made between the methods of Talleyrand and those of Metternich. "M. de Talleyrand," said a contemporary observer, "deceives without lying; M. de Metternich lies without deceiving."

Now, if the exercise of diplomacy were confined to this sort of thing, it would deserve to rank with the less exalted but undeniably dexterous profession of thimble-rigging. But diplomacy involves other possibilities, and draws such respectability as it may possess from other assumptions. Those assumptions are that behind the words and acts of an Ambassador stands the will of the State which he represents, and that behind the State stand the people of his country, determined to give their blood and treasure in making good the claims of their Government. It is the threat of war that has, in the past, given dignity to diplomacy. Indeed, if we invert the saying of Clausewitz that war is the attainment of political ends by other than political means, we may define diplomacy as the effort to attain the same political ends without actual resort to force.

We have now to consider what constitutes effective force, for this is the real problem underlying diplomacy and military preparedness. Before 1914, it was axiomatic that the countries most strongly armed

on land and sea would be able most easily to gain their ends by diplomacy without recourse to hostilities. It is unquestionable that Imperial Germany derived great advantages from the fact that her armies had won three successive wars—those of 1864, 1866, and 1870–71—and that her military supremacy was unchallenged on the continent of Europe. The German sabre, even in its scabbard, lent peculiar significance to the frown of a German Ambassador. "After all," said the Emperor William to an American diplomatist in the early years of this century, "nothing can prevent me from marching to Paris whenever I wish." Yet the consciousness of the possession of overwhelming force may be one of the most subtle poisons that can intoxicate the minds of rulers, statesmen and peoples. Twice, at least, in the decade before the War, Germany found her forceful diplomacy neutralized by the blunders which the consciousness of her strength caused her to commit. Once, at the Algeciras Conference of 1906 that followed upon her attempt in June, 1905, to bully England into abandoning the Entente with France, she was obliged to retreat before the coalition of strength, moral and military, which her tactlessness had created. Again, in 1911, she had to beat a retreat in the Agadir crisis: and if she compelled Russia in the spring of 1909 to yield to a German ultimatum, her triumph was gained at a price that was to render the Great War inevitable.

Even in July, 1914, the tendency of Germany to over-estimate the power of her military machine led her into courses that were to prove fatal. She had no understanding of the moral reprobation she would bring upon herself by her violation of Belgian neutrality. She knew she was doing wrong—her Imperial Chancellor admitted it—but she thought that military success would outweigh everything. By a hair's-breadth she failed; though that hair's-breadth contains the essence of our subject to-night. It shows that even the perfection of armed force is insufficient as a basis for foreign policy.

I referred at the outset to General Walker's letter, and cited his phrase that it is difficult for a soldier to give the soundest military advice, when he is consulted by statesmen or diplomatists, unless he is up-to-date and sees clearly what the country wants and how force could and should be used. Though I am even more of an amateur in questions of tactics and strategy than any soldier can be in regard to questions of foreign policy, you will pardon me if I refer to two instances of soldiers not being up-to-date and of failing consequently either to act upon the soundest military principle or to give the best military advice. I think it is generally admitted that Germany lost the War at the Battle of the Marne. Without the help of the United States, the Allies might not have won it, but they would probably have been knocked out long before America could intervene, if the Germans had taken Paris and had overrun the north-east of France and the Channel ports in September, 1914. The best explanation why they lost the Battle of the Marne was given me some years ago

by a French officer who examined the German orders found on the field of battle after the German retreat. Those orders showed that the German General, von Kluck, swerved to the south-east instead of marching straight on Paris because of his pedantic fidelity to the principle laid down by Clausewitz that the enemy's strongest point should always be the objective of a commander in the field. He thought the strongest point of the French lay in General Joffre's unbeaten army to the east of Paris, and swerved to meet it instead of capturing the strongest point in French *moral*, which was the City of Paris, then at his mercy. Thus he exposed his flank to attack by Galliéni's "taxicab" army from Paris, by General Maunoury's Sixth Army, and by the remnants of the British Expeditionary Force. He failed to understand that, in war as in diplomacy, moral elements play a large and sometimes decisive part. Mistaken fidelity to Clausewitz was his ruin.

A similarly mistaken fidelity to Clausewitz very nearly ruined the prospects of the British Army on the Western front. I well remember an evening at British headquarters on September 13th, 1916, at the table of the Commander-in-Chief, Sir Douglas Haig. It was two days before the second battle of the Somme. With the indiscretion of an amateur, I asked some of the distinguished Staff officers present what the chances were of breaking through and rolling up the enemy line. They thought the chances good, but were not dogmatic about them. "What if you fail?" I asked. "You can't go on for ever hammering away at entrenched positions, and losing probably more men than the enemy loses." The reply I received astounded me. It was to the effect that Clausewitz had laid down the principle that the strongest point of the enemy must always be the objective of a commander in the field; that the enemy's strongest point was on the Western front; and that, if the war could not be won there, it could not be won at all.

Again, as an amateur with more knowledge of foreign policy than of war, I suggested that the enemy's weakest point lay on the Austro-Italian front, and that a policy directed towards the liberation of the Austro-Hungarian peoples, most of which were friendly to the Allies, might disintegrate the Austro-Hungarian army and open the way for so successful an offensive on the Italian front, with the help of French and British troops, as to deprive Germany of her principal ally and to enable the Allies to strike at the heart of Germany through Austria and Bohemia.

My suggestions were dismissed as "politics" which had nothing to do with soldiering, and as involving a mad dispersion of forces. Yet, after the second battle of the Somme, the French offensive in April, 1917, and the British offensive towards Passchendaele in Flanders in the summer and autumn of 1917 had failed to yield a decisive result, the Austro-German forces took the offensive in their turn at Caporetto, crumpled up the Italian army, and very nearly overran the

whole of Northern Italy. The enemy objective (as the German Commander, General von Below, afterwards confessed to Lord Cavan) was nothing less than the city of Lyons, the calculation being that, even if it were not fully attained, the French would be obliged to detach enough troops from the Western front for the defence of the Southern Alps as greatly to increase the chances of the desperate German offensive in the West, which was already being planned for March, 1918.

Why did the Germans conceive this brilliant counter-stroke? Because they felt that Austria-Hungary was disintegrating, and knew that the Austrian Emperor was negotiating secretly for peace in several directions. Therefore they took charge of the Austro-Hungarian forces, and sought to use them in a supreme effort for victory. In haste, the French were obliged to send three divisions and much artillery into Italy; and, sorely against their will, General Sir William Robertson and Sir Douglas Haig had also to detach precious British divisions from the Western front. Then, at last, those of us who were engaged in propaganda against the enemy were permitted to proclaim a policy of liberating the subject Austro-Hungarian peoples—with a disintegrating effect upon the Austro-Hungarian forces that the Italian Commander-in-Chief, General Diaz, handsomely acknowledged after the battle of the Piave in June, 1918. Had that policy been followed earlier, it is probable that the Allied armies would have had Germany at their mercy by the end of 1917.

After all, there is not much difference between soldiering and diplomacy. If either, or both, are to yield satisfactory results, they must be based on knowledge. Mere pedantic fidelity to text-books is fatal. Marshal Foch once told me that, in his belief, the secret of Napoleon's military successes lay in the immense pains he took to gather and to assimilate every detail of information—topographical, economic, political and military—that could possibly have any bearing upon the task in hand. Then, having assimilated it, he made up his mind in a flash and acted like lightning. I asked the Marshal whether he thought Napoleon would have found a way of ending the Great War more swiftly than the Allied Commanders had done. He paused a moment, and said, "How often during the War, when I passed near his tomb at the Invalides, did I not say to myself: 'Ah! You! If you could get out of your box and look at us, what would you think of us?' Napoleon would have said," continued Marshal Foch, "'What! You have telegraphs and wireless! I never had them. You have railways! I never had them. You have long-range artillery and high explosives! I never had them. You have barbed wire, machine-guns, and poison gases! I never had them. You have aeroplanes! I never had them. You have millions of men! I never had them. And, with all that, you are such lubbers as to stick here in dug-outs and trenches for years on

end. Let me show you '—and he would have taken about six weeks to master all the new technique, all the new weapons, and their potentialities. Then, by a stroke of genius, he would have found some new dodge, some unexpected way of applying the new resources, and he would have swept over and through the enemy like a whirlwind. That is what Napoleon would have done."

Diplomacy, like war, is a method of action. But in diplomacy, as in war, the virtue lies less in the method than in the intelligence with which it is used and in the object it serves. Of the training of soldiers I know little. Of the training of diplomatists I know something. It is eminently calculated to break the mainsprings of the bright young fellows who enter the Foreign Offices of the world after stiff examinations and are then, while they are keen and eager to learn, sent to Embassies and Legations abroad—to act as typewriters to those who have too often grown grey and crystallized in the service. As soon as they have passed a year or two in one country and are beginning to know something about it, they are transferred to another country, and thence to another and another until they either become disheartened or learn to look upon the great god " Seniority " as the one source of salvation and a decent salary. A few of them survive and preserve enough elasticity of spirit to be really useful agents of their countries. Most of them become stereotyped mediocrities.

Moreover, diplomatists have nowadays little freedom of action. The telegraph and telephone bind them ever more closely to headquarters. The bulk of what was formerly the exclusive information they could obtain by cultivating the good graces of Sovereigns and powerful Ministers, is to be found in the daily Press. Yet they may, and do, discharge useful functions if they keep themselves up-to-date, understand the countries where they reside, and the countries which they represent. If they are handy with an oil can, or, in more modern phraseology, with a grease-gun, they can allay friction at a dozen delicate points of the machinery of international relations. Such work is unobtrusive, but it may be invaluable. When it is not being done, gears get heated, and dangerous breakages may occur. I could name one instance, at this moment, of an international danger that is attributable, in part, to the lack of lubricating diplomatic work; and I could name another instance in which the growth of serious international misunderstanding may be prevented because an intelligent and open-eyed Ambassador has been appointed to a certain foreign capital.

Yet, when all is said and done, the value of diplomacy lies, in the last resort, in the soundness of the policy which it expresses. In the old days, policy was the perquisite of monarchs and of a few powerful Ministers. Now it is in charge of Governments more or less responsible to peoples. In the old days, dynastic wars were possible. To-day, no great war is possible unless it have the whole-hearted support of, at least, the great majority of the people who provide the men and

the money for it. It is a national enterprise. We know what it costs. France has so clear a vision of its nature that she has passed a law to conscript not only the persons of every man and boy, woman and girl in the country on the outbreak of war, but also their total fortunes and possessions. Thus, should war come, there could be no private profiteering and no shirking. She sees rightly that in the "next war," of which some people talk so lightly, the existence of nations and their whole civilization would be at stake. Her soldiers are thus placed potentially in the position of the executive agents of the national destiny. They cannot, they dare not, look upon themselves and their work as belonging to a special and highly technical department of public activity, but feel bound to be up-to-date and to know whether national policy is so sound as to command the allegiance of the people whose defensive efforts they would have to implement.

I say deliberately "defensive efforts," for wars of aggression are hardly conceivable in Europe under present conditions. If the late war proved anything, it showed the immense difficulty of carrying through a successful offensive even should the initial advantage of surprise lie with the aggressor. I was deeply impressed, during the early days of the battle of Verdun, by an answer Marshal (then General) Pétain gave to my indiscreet enquiry whether he would be able to stop the Germans. "In modern warfare," he said, "when an army has been given 24 hours to entrench itself, it is very hard for an offensive to succeed. We have had 48 hours. If the Germans pass, I shall want to know the reason why."

They did not pass; and I see little prospect of any European army being able to make, with the necessary secrecy, the huge preparations that would be needed to launch a successful offensive. But the problem of defence remains, at least in theory. Defence against whom, seeing that nobody seems likely to attack? Moreover, 50 nations are solemnly bound, by the Covenant of the League of Nations, to lend their aid, economic and military, to any one of their number who may be attacked; and, last summer, 15 nations, whose numbers have since been greatly increased, renounced, by international covenant, recourse to war as an instrument of national policy, and abjured the use of it in their relations with each other. If these undertakings mean anything, they mean that peace, not war, should henceforth be regarded as the major probability of international relationships, and that foreign policies, of which diplomatists are the executive agents, will be policies of peace.

But do these undertakings really mean anything? That is the question, the supreme question, on which we have all to make up our minds. Unless the peoples, whose representatives have signed the Covenant of the League of Nations and the Paris Peace Pact, are determined that those engagements shall mean something, the League Covenant and the Peace Pact may prove not to be worth the paper they are written on. But if peoples make up their minds that the

engagements shall be kept, the civilized world, at least, may be on the threshold of a totally new era—an era in which peace, with all its implications, will become the settled condition of things, and peace, conceived merely as an uneasy interval between wars, will belong to the past.

For men whose profession is the study and the practice of war on land and sea, this question possesses peculiar interest and urgency. It involves not merely a prospect that their occupation may lose many of its attractions, but that the scale of values, in which their readiness for patriotic self-sacrifice gave them a high, if not the highest, position, may gradually be revised. Courage, and efficiency in courage, may be needed in other spheres. Soldiers and sailors cannot fail to be affected by the general transmutation of social standards which assured peace would inevitably entail.

The same holds good of diplomacy. The old conception of diplomatic action as being conducted in an ethical vacuum, with war as the *ultima ratio* in the background, would necessarily be modified. It would tend to become advocacy of national interests, with a Court of Arbitration or a Court of International Law in the background. The successful conduct of foreign policy would require, on the one hand, power of international co-ordination and, on the other, a backing of national and social peace, so that the weight of a country might tell, not by reason of its armed forces, but in virtue of its efficiency in science, in industry, in arts and crafts of every kind, and especially in intellectual and moral power.

You may think, with some reason, that I have said very little upon diplomacy and the conduct of foreign policy in themselves. The omission has been deliberate, for it is useless to dwell upon conditions which, to-morrow, may no longer exist. The old distinctions between verbal and written notes, protocols, memoranda, conventions, agreements and treaties, may vanish. I am persuaded that, should our foreign policy and our diplomacy be so bad, so out of touch with the realities of to-day and the prospective realities of to-morrow, as to involve us in another war, the whole of our present social order and even the existence of the British Empire—the most beneficent experiment in the voluntary association of free peoples the world has ever seen—would be gravely imperilled. We have no choice save to go forward prudently yet firmly. From the end of March, 1905, I saw the Great War coming. For some years past, I have seen peace coming if we have the faith and the pluck to face the risks of so high and so unprecedented an adventure. Believing this, I conceive the task of our diplomacy, that is to say of our foreign policy, as consisting in the international organization of peace abroad, and the work of our statesmen and political and industrial leaders as consisting in the organization of peace at home. True diplomacy, like true statesmanship, is founded on living, up-to-date knowledge in the service of an ideal.

WORK OF THE R.E. WITH THE SHANGHAI DEFENCE FORCE.

(Continued from *R.E. Journal*, June, 1928.)

PART III.

Accommodation and Work of the R.E. Detachment.

As will be well remembered, the Shanghai Defence Force was dispatched in a very great hurry and at very short notice. The vital thing was to get troops to Shanghai before the arrival of the Cantonese. This was successfully accomplished, but inevitably resulted in troops being landed before adequate preparations had been made to receive them. This subsequently proved a very serious handicap on all R.E. work, a handicap which had barely been overtaken when orders were received for the withdrawal of the Indian Brigade.

All the initial arrangements for providing accommodation for the troops were in the hands of the Billeting Committee appointed by the Naval Commander-in-Chief in conjunction with the Consul-General. They had many handicaps to contend with, which, however, are really beyond the scope of this article. But, as the accumulated result of these difficulties, the huts provided, wonderful though it was to have built anything under the circumstances, were quite unfit for permanent occupation.

These Billeting Committee hutments were shortly followed by another four camps erected by the Public Works Department and the Waterworks. In each case, one was a matshed camp and one a hutted camp. These camps were rather better.

None of them, however, were ready for occupation when the troops started to arrive. They had to be kept on board ship for a few days, and then crowded into the uncompleted camps.

Such was the general situation from the accommodation point of view when the R.E. advanced party arrived. It consisted of the C.R.E., one subaltern, two foremen of works, one clerk, and two sappers. With such a staff, and in complete ignorance of the local conditions, any attempt to take over immediate control of the work was obviously out of the question. The one essential thing was to do nothing which would interfere with the provision of accommodation imperatively required. This may sound very simple, but it goes against the grain to watch money being poured into work

badly designed for its purpose, badly carried out with bad materials. But the delay inseparable from alterations or from pulling down bad work was quite impossible. Naturally, the Chinese Contractors realized this, and made the most of their opportunity.

At this period, anyone who wanted anything turned straight to the Billeting Committee, P.W.D., or Waterworks, whichever were concerned. These institutions, having no responsibility for expenditure and wishing to do the troops well, gave everybody everything they wanted, often with the impression that they were free gifts. Such complete and unaccustomed lack of control was too much for many officers, who seemed entirely to lose all sense of proportion and responsibility, and made most unreasonable requests.

The general policy adopted may be summarized as follows :—

(*a*) To allow the three building bodies, the Billeting Committee, the P.W.D., and the Waterworks, to finish the various hutted camps they had started.

(*b*) To arrange for alterations and additions at these camps, when it was possible without causing undue delay.

(*c*) To arrange to meet the immediate requirements of the troops in the numerous billets occupied without notice or warning. At this period the only way of getting this done was to ask the P.W.D. or Billeting Committee to do it, giving them our requirements.

(*d*) Gradually to get in touch with contractors and set up our own organization for getting work done.

The time of the whole R.E. staff was completely occupied in dealing with the immediate requirements of the troops, work which admitted no postponement, and often required getting done within a few hours. Indeed, it was some time before our grip of the situation was sufficient to enable orders to be issued putting a stop to the practice, referred to above, of units giving their own orders. It was vital that there should be no delay in the provision of essentials. Most of the work was done by telephone, and at this period telephone conditions were, like everything else, chaotic.

On 8th March, the main body of the R.E. detachment arrived. 1 major, as S.O.R.E., 2 subalterns, 3 foremen of works, 1 draughtsman, 1 storekeeper, 1 clerk, 4 regimental N.C.O.s, and 3 sappers. 2 subalterns, 2 foremen of works, and 2 sappers, were left behind at Hongkong to assist there with the preparations for the arrival of the troops.

It was realized at once that our numbers were quite inadequate to deal with the urgent calls from innumerable billets and camps, scattered over the ten miles of Shanghai. The personnel left at Hongkong were called up, but Hongkong wished to keep them, and they only arrived on 21st March.

On the 18th March, a telegram was sent to the War Office, asking for the following additional personnel :—

5 Foremen of Works.
5 Clerks.
1 Mechanist Electrician.
1 Lands Officer.
1 Inspector of Works.

These were promised, as also were two additional subalterns, and Captain Brownjohn, a first-class Russian interpreter—asked for a fortnight later.

Alarming details of the terrible hot weather were forthcoming from local residents holding responsible positions, and it was evident at once that all the existing camps would have to be largely reconstructed if they were to be fit for occupation in the summer. The overcrowding, too, was very serious, floor area being down to 30 sq. ft. per man. Either large new billets would have to be found, or large new hutted camps constructed, in all probability both.

A hut had, therefore, to be designed to meet the anticipated weather conditions and the restrictions imposed by lack of time and space. A *questionnaire* was got out and circulated to the Q. staff and Medical branch, and a definite policy to govern the design of huts was fixed. Details of this policy are given in Appendix A.

But no one yet had time to get down to the actual design of the hut. Everyone was living from day to day, and their time was fully occupied with imperative work which literally could not wait.

The standard design of hut finally adopted is shown in the attached photographs. A standard " shell " for all purposes was a *sine qua non* if the work was to be done in time. The one exception to this was a large hut for dining-rooms, canteens, etc., where such a hut was the only solution.

Two other points had to be decided at a very early date. The provision of fans and of lining for the huts, original and projected. In neither case could anything like the quantity required be obtained in Shanghai. After carrying out experiments in a hut, it was decided to get 16" oscillating desk fans. Tenders were called for from the agents of British, American, and Japanese firms. But the Japanese were the only firm who could guarantee delivery of the quantity required in the time available. They were, moreover, infinitely cheaper. An order was placed for 2,500 fans. These fans turned out a great success.

The same difficulty arose in the case of the hut lining. It became evident that the material, to arrive in time, must come from America ; and American agents quoted cheaper prices than British for the same articles. An order was eventually placed with two firms for a total of 1,000,000 sq. ft. of different types of lining. Celotex, Duro,

Pacific, and Fiberlic, in sheets of 9′ x 4′ to fit the standard hut with the minimum cutting and wastage.

The Cantonese reached Shanghai on 21st March. The effect on the work being done by the R.E. for accommodation was as follows :

(*a*) Troops walked into numerous houses in the vicinity of the line, without any formalities. It was a tactical necessity, but naturally led eventually to large bills for damages, which it was quite impossible to check. Many of these billets had no lighting, cooking, latrines, or water arrangements ; this largely increased the amount of imperative work on hand.

(*b*) A general strike was called. The Municipal Council had made adequate arrangements for maintaining essential services. There was, however, some anxiety as to possible interference with the water supply, electric light, and sanitary organization. We had to be prepared for the failure of any of them. Emergency orders were placed for incinerators and water tanks, no ready-made tanks being obtainable in the place. Fortunately, however, none of these eventualities arose.

(*c*) The general strike inevitably held up all our work. Luckily it soon ceased to be general. The possibility of a really complete stoppage of all work was, however, forced upon our notice. It was decided immediately in principle to raise a White Russian Works Company. The possibility of having to import Japanese labour was also considered. For the time being, however, no one had time to take on the job of raising the Works Company.

(*d*) Another brigade was ordered up from Hongkong. The only accommodation that could be arranged for some days consisted of corrugated iron stables with concrete floors. Fortunately, canvas beds were made available in time.

(*e*) The search for accommodation occupied a not inconsiderable time of the R.E. Staff, particularly the C.R.E. It was essential that all buildings proposed as billets should be vetted by us. Some were tumbling down and quite unsafe. It was particularly noticeable at this period how the accommodation available in a particular building was invariably largely overestimated by the " Q." staff.

(*f*) Everyone had to go about armed and in pairs. This was an inevitable drag on the work of our A.E.s and M.F.W.s, and was consequently gradually and quietly dropped. Revolvers were issued to the M.F.W.s in place of rifles.

(*g*) This state of tension and unrest continued for some weeks, but gradually things got more and more normal.

It is time to describe Shanghai from the R.E. point of view.

The Settlement is International, with an International Council. Departments, such as the Public Works Department and Municipal Electricity Department, are almost entirely manned by Britishers, as far as their foreign staff is concerned. But they are the servants of this international body, the Municipal Council.

Everything done by the Municipal Council has to be considered in the light of other nationals. Great care has to be taken not to step on their toes. Compulsory powers for billeting or temporary acquisition of land for camps are out of the question. This has been a serious handicap throughout.

The Public Works Department run all the municipal works, roads, buildings, drainage, parks, etc., except electricity. They were most extraordinarily helpful in giving us the advantage of all their knowledge and experience. Apart from the two original camps, they took on a large amount of work for us, particularly drainage, concrete works and alterations to Municipal Council Buildings, such as schools, used for billets. They also assisted with the barricades and entanglements. Lastly, they were of much assistance in producing drawings and prints for us.

The Electricity Department were very helpful with advice, though the actual construction work was usually done by one of the many foreign firms available. As an indication of the size of the Power Station, it is estimated that the extra load due to the arrival of the various defence forces did not exceed ½ per cent. This, though we used electric light throughout, and had a number of radiators and some 2,500 fans.

The Waterworks Company is a private British Company, distinct altogether from the Municipal Council. The supply of water is ample for all conceivable purposes, and there never was any difficulty in getting connections. The quality is very good, though the doctors thought it necessary to chlorinate it, which meant the provision of tanks.

The Waterworks Fittings Company is a subsidiary of the Waterworks Company, and carries out the work its name implies. This company was very helpful when we arrived, and did much work for us, but there are several other firms probably just as good and often cheaper. The actual connection to the water main has to be carried out by the Waterworks Company.

There are numerous first-class firms of every description—foreign and Chinese—catering for all classes of work.

There is a most efficient Fire Brigade, with equipment reputed to be in advance of that of London. Fire was a serious bogey at the start, when our very limited accommodation consisted of huts packed at ten feet intervals. The only outbreak of any importance was speedily and efficiently dealt with by them.

The sewage disposal system is still chiefly by collection by *ordure*

coolies, *ordure* carts, and *ordure* boats. It is very efficient, like most municipal undertakings, and survived the General Strike, when the consequences might have been very serious. A modern system of sewage disposal has been installed in all the more modern buildings, and is gradually being extended. It was put into one or two of our billets.

The Gas Company is a private British concern: its mains cover most of the Settlement, and there is normally no difficulty in laying on gas for heating or cooking.

The postal system is a purely Chinese affair, and shut down completely during the General Strike, when we became dependent on the D.R.L.S. This service had great difficulty in locating Chinese addresses, and a Chinese chit coolie had to be taken on. Even after the strike the postal system was very uncertain, and numerous letters took days in transit or were never delivered. The Command Paymaster had to send his cheques to the C.R.E.'s office, where contractors were directed to call twice a week.

Before leaving this aspect of the subject, a few notes on the Engineer resources of the city must be included. It has already been pointed out that the supply of water and electricity is ample for all possible military purposes.

The supply of other materials was equally abundant in almost every case. The 700 odd huts erected made not the slightest impression on the vast stocks of timber in the place. There was never any fear of any shortage of hardware of all kinds. Stoves of any pattern can be cast locally in quantities. The only materials for which special arrangements had to be made were hut lining and fans. These have already been referred to, as has also the lack of ready-made water tanks. Turning to essential defence stores, all sandbags had to be imported, but some thousand tons of barbed wire, a rusty relic of the Great War, were found in the city and were purchased at a twelfth of the vocabulary price. There was never any difficulty in obtaining wooden pickets. Suitable wire cutters were, however, hard to come by.

As regards labour in normal times, practically unlimited numbers of Chinese are available of every trade. They are extraordinarily quick workers, and work from 12 to 14 hours a day. Rain, however, completely puts a stop to all work.

Besides Chinese, there are a number of Russian labourers in the place. In case there should be a complete failure of Chinese labour, a number of these Russians (35) were taken on as day labourers, and arrangements were made to form a Russian Works Company, should the necessity arise. All details were worked out, and Captain Brownjohn, a first-class interpreter in Russian, was made available to command it. Russian labour is, however, rather expensive as compared with Chinese.

The geographical and climatic conditions at Shanghai have an important influence on all constructional work in the place.

The city is built on the mud flats of the alluvial deposit of the Yangtse, the natural level of the land is practically flush with or below high water mark. Consequently all land has to be raised some two or three feet before it can be used for any purpose whatever, other than agricultural.

Drainage is a great difficulty, particularly if heavy rain coincides with high water. As much as three inches may fall in an afternoon, and many streets are then flooded.

Typhoons are another worry, about which much was heard. Actually, they very rarely strike Shanghai, and none of the buildings have any typhoon protection, as at Hongkong. The only serious danger is to junks on the river. In 1927, the typhoon gun was fired once, but the typhoon curved away. In the remote eventuality of a typhoon striking the place, all matsheds, including the aeroplane hangars, would of course "go west."

Much was also heard in the early days of the appalling summer. June 15th was the date when conditions would get really bad for three months. This was an extraordinarily accurate forecast as to date, but the heat never got as severe as expected ; the temperature never exceeded 100°. The humidity, however, is very high, and the minimum at night, too, is high, seldom falling below 80°. It was trying in buildings ; without fans, the huts would have been unbearable. The weather changed for the better in the first week of September, when the maximum temperature fell to the 70's and the minimum to the 60's.

On the arrival of the force in February and March, it was very cold and wet : often frost and ice at nights. There was a very dry spell from 1st May to 15th June, which materially helped the building of the huts. This was followed by a fortnight's heavy rain. In July and August, there was comparatively little rain, except for heavy thunderstorms, but it was very humid. Protection against lightning must be carefully watched—one house was struck within twenty yards of the Field Company's gun-cotton.

The numbers for whom accommodation had to be provided reached their maximum at the beginning of June, when the total rose to 16,762 comprising some 70 separate units, depots, etc.

Some statistics as to how this accommodation was found will emphasize the extent of the work with which the R.E. were faced.

Dealing first with billets, these comprise :—

1 hotel and 3 blocks of flats.
14 Municipal Schools.
38 offices and shops.
40 godowns and factories, varying from a size sufficient for one battalion to a size sufficient for one platoon.

89 private houses.
16 miscellaneous properties, among which may be mentioned the Race Club Stand, and stables, 3 dance halls, 1 Turkish bath, 1 amusement palace, 1 jail, 1 theatre, 1 riding school, 1 gymnasium, 2 police stations, and a fire station.

Turning to huts, these were erected in 35 different localities, and comprised :

269 standard huts erected by the Billeting Committee. All of which had to be substantially altered by the R.E.
274 standard 20' huts, R.E. pattern.
12 standard 35' huts, R.E. pattern.
193 miscellaneous hutted shelters for cookhouses, bath houses, ablution shelters, latrines, etc.

Hospitals inevitably were a source of difficulty. For the British General Hospital, a newly-built block of flats with every modern convenience was rapidly converted into a first-class up-to-date hospital. A brand new school was used as an overflow. The Indian General Hospital was in a piano factory, overflowing into huts. A dance hall and an old tumbledown school, overflowing in each case into huts, were used as isolation hospitals. The latter, the original home of the hospital for the first troops landed, was a most unsatisfactory affair.

Mention must be made of the ammunition huts. When first required, there was literally no suitable site above water level available. Large grids 3 feet high were built of 10" x 10" and 12" x 12" timber, which happened to be at the site, and was lent by the Lumber Company. Corrugated iron sheds were built on the top. Six months later, the Lumber Company wanted their timber back. It had to be bought at a cost of some £2,000, with, however, an undertaking to buy back later.

Godowns were used for Ordnance and Supply Depots. Ground was rented and filled for the R.E. Stores, and a hut and sheds built.

No pier work had to be done, though one for ammunition was asked for. It would, however, have been a big job.

Very little space was available as parade grounds or football grounds. Great difficulty was experienced in obtaining suitable sites even at fabulous rents.

Hundreds of thousands of tons of earth filling had to be carried out at the various sites selected for hutments and other purposes. This earth had to be covered with thousands of tons of ashes.

Taking the different categories of accommodation in turn, the R.E. work involved will be outlined in greater detail.

Billets of all sorts were always the most troublesome. Each billet

was different from any other, and consequently required special treatment in each case. There being no terminal contractor and no possibility of getting one, each separate job had to be put out to tender. At the start, all jobs were rush jobs; there was never any time to call for competitive tenders in an orthodox way; a contractor had to be "caught" who would take on the job; he was asked verbally or on the telephone what it would cost, and in 99 cases out of a hundred his figure had to be accepted. At the very start it was even worse; the P.W.D. or the Billeting Committee were asked to get the job done without any discussion as to the cost.

Billets more often than not were either empty houses on the point of being demolished for rebuilding or brand new buildings just approaching completion. No other empty buildings existed.

The old houses were most depressing places, and usually required complete water installation for all purposes and complete rewiring for light. Often portions of the building had to be propped up or extensive repairs done to the roof.

The new buildings were usually left in the hands of their original architect and contractor to finish according to our wishes. This policy had much to say for it, and was really inevitable, but the work put in was often badly designed, badly executed, and invariably very expensive.

One large building had an extra storey added on the roof. In the absence of sufficient staff to take on this job, one of the leading architects in the place was commissioned to do it all. Details of design and standard of work were surprisingly poor, and the cost most excessive.

The original huts, erected by the Billeting Committee, required drastic improvement.

They had been built on a wooden frame resting straight on the ground without any foundations of any sort, or any form of ventilation. The ground between the huts had then been ashed to make it passable in wet weather. As a result, water accumulated under the huts, and many of them were almost afloat. It was found by experiment that they could be levered up as they stood, first one side, then the other. They were all raised in this manner 18 inches, and supported on short blocks of 10″ x 10″ timber resting on a reinforced concrete foundation. The water could then be pumped out and the ground underneath levelled up with ashes.

Four to eight extra windows had to be provided in each hut, also louvred ventilators in each gable end.

The huts had to be lined, and wired for electric fans.

A complication was caused by the failure of one of the contractors to produce the hut lining to time. In one camp three-ply wood was therefore used, in another beaver board, but the majority of these old huts were lathed and plastered. The serious objection to this

latter method was the necessity of emptying the hut for five days or a week.

The original kitchen and latrines built were condemned by the Medical Authorities, and had to be completely scrapped and rebuilt. Great importance was attached to making everything flyproof, and to putting down concrete floors for cleanliness on a most liberal scale, not only inside but outside these buildings.

In order to make more air and light, a number of huts had to be removed altogether. Most of them were cut up into sections and re-erected on neighbouring sites, often made available by the removal of redundant stables.

The outstanding point in the erection of the new huts was the great difficulty experienced in proper supervision, even when a number of additional civilian clerks-of-works had been taken on and every available R.E., N.C.O. and Sapper, employed on this particular job.

The contractors had seen the bad material and work put into the original huts. They based their prices for the new huts on the assumption that we should accept similar work and material. They knew we were building against time, and work was being done day and night.

Much timber had to be forcibly removed and destroyed before they could be induced to use reasonably good material.

Tenders for additional huts went up 10 to 15 per cent. as a consequence.

In addition to the bare huts, separate contracts were required in each case for electric wiring and fittings, hot and cold water system, and drainage. Owing to the dead-flat low-lying ground surface, drainage was always essential. Fire hydrants were also installed in many cases.

In addition to billets and hutments, there was a large amount of miscellaneous work.

Some eight or ten tented camps were erected. These had all to be provided with the usual camp accessories, but on a more elaborate scale than is customary, owing to the camps being occupied for months on end, and the consequent medical requirements. Hundreds of yards of duckboarding were also necessary.

Two steam sack disinfectors were obtained, made to the rough designs of the medical authorities, but only one was ever put up.

Four large matshed hangars were erected on the temporary aerodrome. One collapsed shortly after erection, owing to interference with its foundations by the Waterworks Company when putting in fire hydrants and mains. No damage was done to aeroplanes, and the Company paid for its re-erection. Each hangar could take six machines.

Matshed cover was also provided for dumps of hay, horse standings, gunsheds for the artillery, and as protection for the armoured cars

Matsheds are erected very quickly by local contractors, but only last about six months without repair.

It is time to revert to the question of personnel and its organization.

From the 22nd March, Shanghai was divided for R.E. purposes into an Eastern and Western Area, each with two Assistant Engineers, and three or four Foremen of Works, but no clerk, draughtsman, typewriter, or books of reference.

There was no Officer i/c R.E. Stores, and so everyone had to buy as best they could. The stores at this period were to all intent and purposes non-existent. An account of the growth and development of the stores follows in Part 4.

All financial work and billing was concentrated in the C.R.E.'s office.

A list is attached in Appendix C showing the additional staff, which it was found necessary to engage locally. But this staff knew nothing of military methods and practices, and the actual dealings with the troops had to be left in the hands of the military personnel, who for three months worked 16 hours a day, seven days a week.

The welcome arrival of Lieut. Palmer, five Foremen of Works, five Engineer clerks, and one Mechanist Electrician on 30th May came just in time to save a complete breakdown of the original staff, many of whom had had to retire to bed for short rests.

On 20th June, Captain Brownjohn arrived from Hongkong, after handing over to a relief sent out from England. In addition to taking over the directly employed Russian labour, he was appointed Officer i/c R.E. Stores, and made responsible for the R.E. Serjeants' Mess.

With the arrival of these reinforcements, the place was divided up into three areas instead of two, the locally-employed staff was gradually reduced, and work generally assumed a more normal aspect. Further, it became possible to give officers, W.O.s, N.C.O.s, and men a holiday and rest at Wei-hai-wei.

The last reinforcement, Lieut. Evans, arrived to take up his duties as Inspector of Works, on 21st August, when most of the billing work had been finished. On his arrival, notice was given to the Civil Assistant Engineer who had recently been employed on this work.

In the middle of June, O.C.R.E., Tientsin, asked for the assistance of one officer to help with the arrangements at Wei-hai-wei, where a Convalescent Depot and a battalion for guard duties were being established. No works officer being available, Lieut. Ray, of the 10th (Field) Co., Q.V.O. Madras Sappers and Miners, was sent up on 20th June.

Two points, which were of great assistance to the detachment sent, were the posting of Sappers as officers' batmen, and the number of motor bicycles allowed.

The Sappers, in addition to acting as officers' batmen, were

employed during the rest of the day in various capacities, as clerks, as assistant foremen of works, supervising work being done by contractors, as blue-printers, and as chauffeurs for the sidecars obtained locally.

The motor bicycles provided were invaluable, but even so, additional motor transport had to be obtained, namely, three motor cars and three sidecars, one for each of the three divisions.

The four regimental N.C.O.s were also of great value. In the first place, they were employed on the defences, being attached to No. 10 (Field) Co., Q.V.O. Madras S. & M. Later, they assisted the various A.E.s and in the stores as required.

Another point, which would have greatly facilitated work, would have been the provision of complete offices, not only for the C.R.E., but for the stores and the three divisions. Without a *Barrack Synopsis, Design and Construction of Military Buildings, Drainage Manual, W.O. Pattern Book, D.F.W.'s Circular Contracts,* Type Plans and detailed drawings of standard type huts, etc., an officer in working out a design for some work is limited to his own experience and imagination, instead of being able to draw on the experience of others over a long series of years, as expressed in the various publications mentioned. Moreover, it takes him a day to do what should take him only an hour. Working drawings of huts were cabled for on the way out; in their place, proofs of the plates destined for *M.E. Vol. VII, Accommodation,* were sent; these were useful up to a point, but the detailed drawings asked for would have been infinitely more so. It is difficult to think of and work out every detail satisfactorily, when every other minute one is being interrupted by urgent demands for jobs to be carried out immediately in many different places. It must necessarily be much better done in peace and quiet, away from the rush of urgent work.

In conclusion, a few words on the financial side of the work will be of interest.

In six months, nearly 1,000 bills totalling more than £250,000 were passed. For the first three months, only two clerks were available, who had also to cope with all the other work of the C.R.E.'s office. A civilian stenographer was engaged, and eventually an Inspector of Works, but naturally he knew nothing of army forms, method or regulations. Only the understanding sympathy of the Command Paymaster and Financial Adviser made it possible to pay any bills at all.

PART IV.

THE R.E. STORES.

The Stores were opened on 28th March in a corner of the S. & M. Company Camp at Ward Road by Q.M.S. Morris, his staff consisting of five Chinese coolies, of whom one was, theoretically, English-

speaking. Q.M.S. Morris had taken the precaution to leave England with a portmanteau full of the essential store-keeping forms; also at one of the intermediate ports he carried out a raid on the local R.E. Stores office, resulting in the capture of ledger-covers and sheets. Consequently, he was able from the beginning to keep his books in the correct manner, and when the audit staff appeared in July, they were considerably astonished to find all transactions properly recorded.

For the first few weeks, the stores dealt with were mainly for defence, large numbers of sandbags, coils of barbed wire, and Foochow pickets being distributed to almost every part of the Allied Front. The ledger-keeping was done at night in a corner of the A.E.'s office. In the middle of April, the R.E. Yard was properly fenced in, and two C.I. stables converted into more or less burglar- and weather-proof storehouses.

A large selection of tools had now to be obtained by local purchase, to supplement the tools of the S. & M. Company and to equip the Russian direct labourers. The staff was at this time increased by the addition of one European Serjeant and one Sapper, and one Indian Sapper, who all did excellent work, though without any previous experience of stores.

A stock of maintenance stores of every description was gradually accumulated, purchases being made at first entirely through the P.W.D. On the arrival of Captain Brownjohn and a Q.M.S. clerk in June, purchasing by local tenders for all except Ordnance Stores was begun in order to relieve the P.W.D. of the extra work thrust on them, and also to simplify our financial dealings.

In July, an office and storehouses were constructed, on a site opposite the S. & M. Company Camp, to the relief of all concerned. The old stores took up much space in the S. & M. Company camp; yard space was practically non-existent, and the tin-roofed office a perfect inferno during the day. In August, the task of installing the stores in the new premises was tackled, Q.M.S. Morris being sent to Wei-hai-wei for a much-needed holiday.

Up to date, the total number of transactions has been 2,303, made up of 522 receipts and 1,781 issues. The number of store bills has exceeded a total of 150, representing an expenditure of £20,000 approximately. The space occupied by the Stores measured 57,000 feet super, of which 7,600 were office and store accommodation, the balance being yard.

The experience gained points to the following:—

1. A full staff should be on the spot from the beginning to prevent breakdowns in health through overwork and to ensure economy in the issues of stores.

2 Where much local purchase is to be resorted to, an officer in charge should be sent; the S.O., R.E., on whom the purchasing duty otherwise devolves, is fully occupied with other duties.

3. A reserve of tradesmen's tools should be sent out by Ordnance with the Force. Apart from the possibility of the employment of direct labourers not in possession of their own tools, as was done here, a Field Company's tools are not sufficient when the whole personnel are turned on to construction work.

Complete chests of tools are not required so much as a supply of the more commonly used tools, *e.g.*, saws, hammers, planes, etc.

PART V.

MEMORANDUM ON ACTIVITIES OF LITHO. PRINTING SECTION, R.E.

The Lithographic Printing Section was mobilized on Sunday, 23rd January, 1927, at the Ordnance Survey Office, Southampton. It consisted of a total of 12 men, of whom the senior was Sjt. Prudent, R.E. The trades were as follows:—

6 draughtsmen.
3 litho. provers.
2 ordoverax workers,
and 1 photographer.

The equipment consisted of

1 quad crown hand press fully equipped.
1 ordoverax outfit,
also dry plate photo 5 x 4 field and copying camera.

The stores brought out were considered sufficient for three months for all the above processes.

Stores and equipment were loaded on Friday the 28th on s.s. *Kinfauns Castle*, and the Section embarked the following day. Shanghai was reached on the 8th March after trans-shipping at Hongkong on to s.s. *Kamala*. The strength of the Section was further increased early in June by the arrival of four draughtsmen R.E. and one clerk.

To start with, stores and equipment were placed in a shed, but after about ten days a suitable workshop was discovered, and work was able to commence. As there was no Survey Officer with the Section, it worked directly under the G.S.O. (3) in I.

As ever in these cases, the work was heaviest at the beginning, draughtsmen's work in particular being very heavy. One job

involved the printing of a thousand copies of a map in three colours, *i.e.*, three thousand printings. This took no less than from the 7th April to the 9th June, and demonstrated quite clearly how extremely heavy and exhausting is a hand-operated quad crown press. Work in general, however, consisted in small jobs, blue prints, and ordoverax for C.R.E., C.R.A. (*e.g.*, panoramas from O.P.s, etc.), and small sketch maps for the General Staff. Later, there was a fortnightly situation map.

The following difficulties were encountered, all climatic :—

As the summer advanced, the hot weather became very trying, and it was extremely exhausting working the hand press.

The humidity was very high indeed—75%, 85%, and even over 90%—which led to every kind of trouble with paper and all the processes.

Difficulty was encountered at all times in working the ordoverax, and by the commencement of June the process had to be abandoned altogether, and vandyke took its place, although the Section was not properly equipped for vandyke.

The sun is by no means dependable in this climate, and for days, almost weeks on end, there was little or no opportunity of blue printing in the Section, as no artificial light was available in the equipment.

After the first alarms and excursions of March had died away, so automatically did the demands on the Litho. Section become less, and from June onwards there was very little work.

Map distribution was undertaken by two N.C.O.s of the Section who were draughtsmen, and who were, therefore, able to continue their work in the map room.

PART VI.

Work of the Army Postal Service.

The Army Postal Service in China had to function under severe difficulties during the period immediately following the arrival of the Force in the early days of March last. An advance party left the U.K. on 29th January, 1927, and arrived in Hongkong on 28th February, to find that the S.D.F. was split between Hongkong and Shanghai, although all the mails had, in accordance with information received from the War Office, been consigned to Shanghai. Arrangements had to be made, therefore, for the mail boats to be boarded in Hongkong, and for the whole of the S.D.F. mails to be gone through there, in order that matter for the troops in Hongkong could be selected and the remainder of the mail sent to Shanghai. A similar arrangement had to be made later at Shanghai, as regards the mails *via* U.S.A. and Canada, the mails for the troops in Shanghai being selected, and the remainder of the mails being sent to Hongkong. Gradually, as units were brought up from Hongkong to Shanghai, the

position became fairly stable. Units were located in Hongkong, or Shanghai, as the case might be, so that through mails no longer had to be tapped at either place.

The retention of R.A.S.C., R.A.O.C., etc., personnel at Hongkong necessitated a certain amount of sorting from nominal rolls.

The sending of details to Tientsin and Wei-hai-wei, of course, complicated matters, but no serious difficulties in this connection arose.

As a matter of interest it may be stated that the arrival of the main party of the R.E. Postal Section in Shanghai coincided with the beginning of the Chinese postal strike. This proved to be a fortunate circumstance, as it was possible to provide the civilian European population with an emergency postal service which was much appreciated. About 16,500 items for all parts of the world were posted by civilians during the emergency period, and incidentally, the amount of about £200 was added to British funds.

A statement is attached in Appendix B showing the volume of work dealt with during the period April to July inclusive. The postings were surprisingly heavy in proportion to the size of the Force. The average weight of a bag is half-a-hundredweight, so that the average weight of mails dispatched monthly was about five tons.

Letters and newspapers superscribed "*via* Siberia" arrive at their destination in either direction in about 20 days, those sent *via* U.S.A. and Canada in about 26 to 28 days, and those sent *via* Suez in about 34 days.

APPENDIX "A."

DECISIONS GOVERNING DESIGN OF HUTS.

1.	Floor area per man	50 sq. ft. as against 80 laid down for South China and 70 for North China.
2.	Cubic space per man ..	600 cubic ft. as against 1,040 laid down for South China, and 770 for North China.
3.	Distance apart of beds ..	6′ centres.
4.	Spacing of windows ..	1 to every 2 beds.
5.	Stoves	2 per hut.
6.	(*a*) Shelving	3ft. per man.
	(*b*) Coat pegs	3 per man.
7.	Arm racks	In men's huts, suitable for locking by sections if required (actually, locking apparatus was never issued).
8.	Internal lining to huts ..	To be supplied.
9.	Verandahs	Asked for by medicals, but not provided owing to lack of space.

10.	Flywiring	To be provided in cookhouses, dining-rooms, and bread and meat stores.
11.	Ceiling or double roof ..	Double roof, *i.e.*, internal lining on rafters.
12.	Distance apart of huts ..	Twice the height of the eaves (actually it usually has to be less).
13.	Provision of electric fans ..	In all huts, and in all offices and cookhouses.
14.	Accommodation for field officers	One room.
15.	Men's dining-rooms	To be provided for half battalion at a time if space was short.
16.	Officers' Mess	Anteroom, Messroom and offices.
17.	Serjeants' Mess	Messroom and offices.
18.	Kitchen	On synopsis scale.
19.	Baths	7 or 8% showers, 1% slipper.
20.	Waterborne sanitation ..	In exceptional cases only.
21.	Chlorination	Water tanks sufficient for one day's supply of drinking water at a gallon a man.
22.	Offices, stores, guardroom, etc.	On synopsis scale as nearly as possible.
23.	Horse standings	Hard standings and matshed covers.
24.	Recreation Establishments..	On synopsis scale as nearly as possible.
25.	Drying rooms	To be provided.
26.	Medical inspection rooms ..	To be provided.
27.	Sheds for guns, etc. ..	To be provided.

APPENDIX "B."

RETURN OF WORK, ARMY POST OFFICES, S.D.F.

	April.	*May.*	*June.*	*July.*
No. of bags of mail received ..	282	362	498	516
No. of bags of mail dispatched	141	146	220	278
No. of registered items received	713	894	1168	1088
No. of registered items dispatched	718	830	1139	1140
Amount of sales	£1,582	£1,873	£1,566	£2,329

APPENDIX "C."

SUMMARY OF CIVILIAN ASSISTANTS.

Appointment.	*Salary.*	*Total Numbers Employed.*	*Maximum Numbers employed at any one time*	*Total Men Weeks.*	*Remarks.*
Assistant Engineer ..	$400 per month = £50.	3	3	52	Includes P.W.D. Liaison Officer. One A.E. acted as Inspector of Works for two months.
Foremen of Works ..	$80 per week = £8.	6	5	85	
Russian Supervisor ..	$70 per week = £7.	1	1	21	Still employed with Russian labour.
Draughtsman	From $40 (£4) to $140 (£14) per month	5	3	54 (up to 30/9	Two still employed.
Typist	One at $200 (£20), One at $100 (£10) per month	2	1	21 (up to 30/9)	One still employed.
Messenger and Cleaner	$3.50 per week = 7/-.	1	1	22 (up to 30/9)	Still employed.

N.B.—The staff of the Billeting Committee (1 Secretary, 1 Clerk, 1 Messenger) are *not included* above

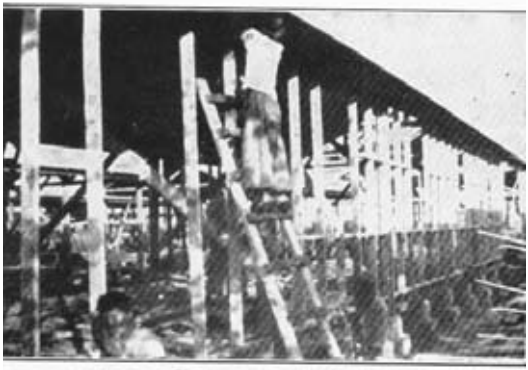
Pile driving.

A heavy load.

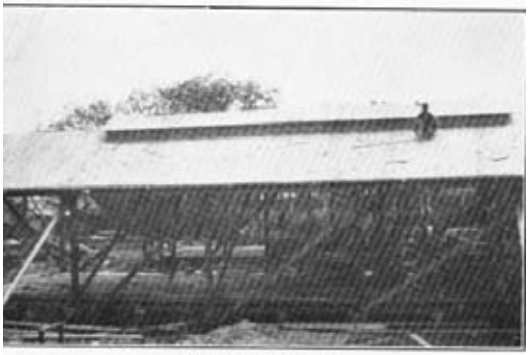
Contractor, foremen, and ground frame of R.E. Standard Hut.

Shanghia Defence Force

R.E. Standard Hut under construction.



Fixing wall studding.



Boarding the roof.

Boarding the Roof

Fixing wall boarding.

Exterior of completed hut

Interior of completed hut

Interior of Completed Hut

The hut raised

Cross-strutted ready for moving.

On the move to new site.

On the move to new site

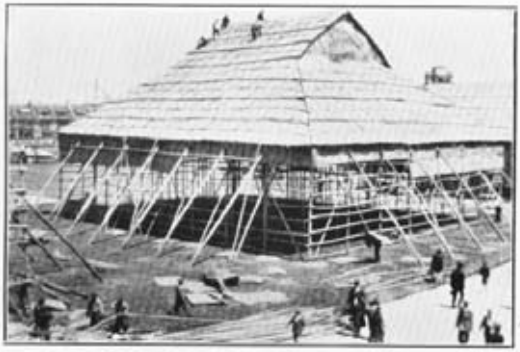
Standard "Billeting Committee" Hut.

Levers in position for raising.

Raising by "walking the plank."

Walking the Plank

Joining up at new site.



Matshed hangar under construction.

Hangar completed.

Hangar

OVERLAND TO INDIA.

By Lt.-Col. H. T. Morshead, d.s.o., R.E.

(Reprinted, by permission, from *The Indian Daily Post*, Bangalore.)

Introduction.

The following notes have been compiled by one who has recently accomplished the overland journey to India, in the hope that they may prove helpful to any others contemplating this easy and highly interesting alternative to the stereotyped sea passage to or from Europe.

The title, " Overland to India," is not strictly accurate, since the last break of the journey was made by sea from Basra to Bombay. In order to complete the journey wholly by land, it would be necessary to buy (or hire) a car in Baghdad, and drive oneself 1,000 miles or so across Persia to the Indian railhead at Dusdap or Quetta. In the following article it has only been possible to record a few general impressions of the journey, together with such items of information as may assist intending travellers in planning their route. Fuller details regarding the countries traversed may be obtained from any of the published handbooks ; of these, *Cook's Traveller's Handbook to Constantinople, Gallipoli and Asia Minor* (price 6s.), and *Cook's Traveller's Handbook to Palestine, Syria and Iraq* (price 10s. 6d.), are the most up-to-date and should suffice for most purposes.

I.—London to Constantinople.

Sunday Morning, 27th November.—The London fog, so murky and yellow that one cannot see across the road ; flares are blazing here and there at street corners, and my taxi can only move at a slow crawl, with its lamps switched on. Punctually at 11 a.m. the Continental Boat Train leaves Victoria Station. As we leave the great city behind, the fog lightens somewhat, revealing glimpses of the trim fields and hedgerows of the Weald of Kent. On this dull morning, however, the personalities of my fellow travellers in the comfortable pullman saloon form a more intriguing subject for study than the fleeting panorama of the " Garden of England," half visible through the clouded windows of the train. A few pairs of skis in the guard's van testify that the winter sports season in Switzerland is beginning early this year ; most of my companions, however,

judging from the labels on their hand-luggage, are bound for the more Capuan delights of Brussels, Paris or the Riviera. I see no other luggage labelled, like my own modest suit-case, "Bombay, *via* Paris, Constantinople, Aleppo, Damascus, Baghdad and Basra." A foggy morning generally means a smooth Channel crossing; to-day, fortunately, is no exception; the *Maid of Kent* glides quietly out of Dover Harbour, and two minutes later the white cliffs of England are but a memory.

At Calais, a comfortable reserved *coupé* is in readiness on the Simplon-Orient Express, which takes one direct to Constantinople in three days. Here, as elsewhere on this journey, customs formalities are dispensed with in the case of hand-luggage of "through" travellers. Our first halt is at the Gare de Lyons in Paris, where we spend two hours while the train is being shunted and remade. The monotony of the journey may conveniently be relieved by a stroll in the town and dinner at a restaurant.

Monday Morning.—One awakes to find that the clock has gone forward an hour to central European time, and the train leaving Brigue just before entering the Simplon tunnel. From the abstract time-table, which the International Sleeping Car Company kindly presents to all travellers on their cars, I gather that we crossed the Franco-Swiss Frontier at Vallorbe at 5 a.m. The *wagon-lit* attendant takes charge of one's passport and railway ticket for the whole journey, and produces them as required from time to time by the respective officials concerned; one is thus enabled to sleep undisturbed through any international frontiers which the train may cross during the night.

From the windows of the breakfast car, as we pass the vineyards and chestnut woods of Pallanza, Stresa and Baveno, one can watch the morning mists lifting over Lake Maggiore. One notes, too, the semi-tropical appearance of the trim little railway stations with their palm trees and dwarf bamboos. Speeding eastwards all day across the plains of Lombardy, oriental memories are awakened by the universal dun colour of the cattle, and by the bunches of bright yellow Indian corn cobs hanging out to dry in the sun in the open verandahs of the peasants' houses. Far away on the northern horizon are the snowy summits of the Rhaetian Alps.

Venice is reached about five in the afternoon, just as the wintry sun is sinking. One's first impression is of endless mud flats covered with acres of belching factories and a forest of electric poles and cables of the most hideous variety. Twenty minutes later, however, the train backs out again over the same causeway as that by which it arrived; dusk has now fallen, dulling the crude outline of man's industrial handiwork, and a myriad twinkling lights are now reflected star-like from the placid surface of the lagoon.

Strangers to Venice may well arrange to break journey here for a day or two. My own programme allowed for a day's halt at the far less convenient town of Zagreb in Jugo-Slavia, which is reached at the unpleasant hour of 3.40 a.m. However, my good friend the British Consul is in readiness for me with his car at the station, and soon I am asleep in a comfortable bed, not to awake until ten in the morning.

Zagreb, now a provincial town in the kingdom of Jugo-Slavia, was formerly known, under the name of Agram, as the capital of the little kingdom of the Croats, which for many centuries was incorporated in the Austro-Hungarian Empire. The town boasts of many excellent buildings, and a picturesque note is struck by the gaily embroidered dresses of the peasant women, with their country produce, who throng the various markets. Jugo-Slavia possesses but few arts or manufactures; the country is almost entirely agricultural. As the train hurries along, mile after mile, across the rich, alluvial and almost treeless plains of the Save, with their endless panorama of wheat, potatoes and millet, one might easily imagine oneself in the Punjab; there are the same winding, unmetalled, unfenced country roads, the same villages and the same irrigation wells worked by the familiar water-lift with its tall pole, lever and counter-weight; here and there an occasional creaking "Persian wheel." Nor is the illusion dispelled by the general appearance of the villagers on this bright winter morning, with their sheepskin coats and round Astrakan hats, and the draught oxen yoked in pairs to the farm wagons. Crossing the muddy waters of the River Save by a steel girder bridge, we arrive soon after midday at Belgrade, where a halt of twenty minutes is scheduled. This town, the capital of the erstwhile kingdom of Serbia and the present kingdom of Jugo-Slavia, is situated in the angle formed by the junction of the River Save with the Danube; it lacks, however, the dignity and impressiveness of its western rival, Zagreb.

Beyond Belgrade, the line trends in a somewhat more southerly direction past Nish to the Bulgarian frontier, which is crossed at Tzarlbrod at 9 p.m.; and here the clock goes forward a second hour to Eastern European time. Meanwhile, the country has again become more accidented in character; and the railway, now reduced to a single line, winds in and out among gently sloping coppiced hillsides, harbouring numerous little hamlets of tiled and whitewashed huts.

Thursday, 1st December.—The temperature must have fallen pretty low last night, as I awoke to find the outside of my window obscured by great icicles eighteen inches long, formed by some water which had spilled in the night from the overhead tank in the roof of the carriage. I noticed, too, that the couplings of the train were

decorated in a similar manner through the condensing of the steam, which had been escaping from a leak in the steam-heating apparatus. Inside the train there was, however, no lack of warmth ; and it was perhaps due to this cause that I awoke only at 9 a.m., just in time to find the train crossing the Maritza River by a big bridge. The fact that we were now in Turkish territory was presently confirmed when the bill for my *petit déjeuner* was presented to me printed in Arabic characters and reckoned in piastres.

All day the panorama from the carriage window consists of bare, dry, rolling, grassy prairie, unrelieved by a single tree from horizon to horizon. Here and there, on a piece of rising ground one may see a village of squalid mud huts capped by a trim, whitewashed mosque with its tall, circular minaret. A few bare-footed, unkempt children come to gaze silently at the train as it stops from time to time at the stations. Turkish cultivation appears to be conducted on primitive lines, the soil being loosened by a simple wooden plough drawn by a pair of oxen ; afterwards, the seed is sown without any apparent attempt at harrowing or rolling, nor were there any signs of the use of manure. Once only one noted, with surprise, a Fordson tractor hard at work drawing a multiple plough, which left in its wake a series of straight, well-turned furrows.

For the last twenty miles before reaching Constantinople, the railway skirts the shore of the Bosphorus ; and the view across the still waters, with the sun setting over the Sea of Marmora and gilding the marble cliffs of the Asiatic shore, is one of singular charm and beauty. Just as dusk is falling, the train draws up at Galata terminus, where taxis are waiting to take one across to the hotels at Pera, the residential quarter of the city on the eastern side of the Golden Horn.

Friday, 2nd December.—To-day, all banks, shops and offices are closed, but in a few weeks' time an order is to come into force by which, in future, Sunday will be observed instead of Friday as the weekly holiday throughout the Turkish dominions. Meantime, one could but note the declining hold of religious observance among the population of the city. In the great mosque of St. Sophia, as well as in several others which I visited during the hour of prayer, the worshippers could be counted on one's fingers, where, twenty years ago, there would, according to my guide, have been thousands. To some extent, no doubt, this decline is due to the fall in the population of the city from its pre-War figure of 1½ millions to about 750,000, as disclosed by the census of 1927. It is now a crime punishable with imprisonment for any Turkish man to wear a fez, or for any Turkish woman to veil her face in public. This piece of legislation is said to have been acclaimed more cordially by the ladies of the country than by the opposite sex ; anyway, the result is that the

streets of Constantinople do not to-day differ largely in appearance from those of any other large Western city.

Besides the great mosque of St. Sophia, one should on no account miss seeing the Museum of Antiquities and the Seraglio Palace and gardens, all of which are situated in the Turkish quarter of Galata. The whole of the palace of the old Sultans, with its numerous pavilions, is now open to the public on payment of a small fee for admission; particularly striking is the unique and priceless collection of old china, comprising over 15,000 samples of the oldest known Chinese workmanship.

II.—Constantinople to Bombay.

The bi-weekly train to Aleppo starts on Tuesday and Saturday mornings from Haidar Pacha terminus, on the eastern shore of the Bosphorus. This quarter of the city is reached by means of a steam ferry which plies at frequent intervals to and from the Galata Bridge, at the mouth of the Golden Horn. While waiting for the train to start, one may see, close to the station and in front of the Medical College at Scutari, the cemetery of the British soldiers who died in the base hospital during the Crimean War. A tall obelisk in the middle of the cemetery commemorates the labours of Florence Nightingale.

International *wagon-lit* carriages, identical with those used in Europe, run on the Turkish railways in Asia Minor, but only the daily express train to Angora is equipped with a restaurant car; on the Aleppo line and elsewhere, the trains stop at intervals in order to enable passengers to get their meals. The stations do not invariably boast any form of buffet, and it is occasionally necessary to search the town for a restaurant, unless one provides oneself beforehand with sufficient food for the two-day journey to Aleppo. One notes, by the way, that the line is still officially styled the Anatolia-Baghdad Railway, although its present terminus is no farther than Aleppo.

Leaving Haidar Pacha at 9.30 a.m., the train skirts the north-east shore of the Bay of Ismid for the first fifty miles. The landscape is green and verdant, even in winter; rich fields of wheat, millet and tobacco alternate with groves of fig, peach, apple and quince trees. After half-an-hour's halt for an indifferent lunch at Ismid station, we plunge inland through the highlands of Anatolia. These reach their maximum development in the neighbourhood of Mount Olympus, where just before dark we traverse a remarkable limestone gorge some fifteen miles in length; bare, rocky limestone hills rise sheer for 1,000 feet on either hand, leaving scarcely room for the railway to zigzag to and fro across the little mountain stream, with

which it competes for possession of the valley. Here and there drifts of snow peep out beneath the bank of cloud which hides the crest-line of the ranges.

At 8 p.m. we halt for dinner at Eski Shahr, the junction station for the Angora line. From here onwards, the railway traverses a barren, featureless plateau some 3,000 feet above sea-level; and though the train itself is well warmed, one is glad of one's greatcoat when getting out at the station. My fellow travellers are as follows:—A young Syrian merchant returning to Aleppo from a business visit to Salonika, a Persian rug merchant with headquarters in Paris, a Jewish company director from Constantinople, and an alert young Turkish lawyer bound for Adana; all speak excellent French, and we while away the hours by playing poker for small stakes. About eight o'clock on the evening of the second day after leaving Haidar Pacha, we reach the Taurus mountains; as the train whisks in and out of the twenty or more tunnels one can catch glimpses, by the light of the full moon, of the terrific chasm of white limestone through which the railway threads its way.

The Syrian frontier is crossed at six o'clock in the morning, and Aleppo is reached at 9.30, exactly 48 hours' journey from Constantinople. From Aleppo one may either proceed by the Syrian railway to Damascus, or one may go—as I did—by car to Beyrout. The latter journey takes about ten hours; the road is bad for most of the way, and very dusty. One passes through the towns of Hama and Homs before reaching the Mediterranean coast at Tripoli. Most of the Syrian roads are considered unsafe for single cars after dark; we were accordingly stopped by the police at Homs, and only allowed to continue our journey at six o'clock next morning.

Beyrout, the headquarters of the French administration in Syria, is the largest seaport in the eastern Mediterranean. It is also of interest as the spot where the British patron Saint, Saint George, is alleged to have slain the dragon, and the bay on which the town is built is still called St. George's Bay. Here, as elsewhere in the middle East, there are a number of Russian refugees who eke out a precarious livelihood by keeping grog shops and dancing halls. Malaria is prevalent in Beyrout, and mosquito nets are very necessary during the summer months.

The Nairn weekly motor convoy leaves Beyrout on Thursday mornings, and Damascus is reached in time for lunch. The road, which is in excellent condition, crosses the Lebanon range at a height of 8,000 feet above sea-level. From the summit one looks back, over the vineyards and town of Beyrout, to the blue Mediterranean beyond. To the south is the snowy summit of Mount Hermon. After a long winding descent, we cross a flat valley ten miles wide before climbing the lesser range of Anti-Lebanon. The approach to

Damascus is through miles of orchards—fig, olive, vine, quince, pomegranate and orange—watered by the river Barada (the Biblical Adana) before the latter loses itself in the Syrian desert. Next morning, we are on the road by 7 a.m., and an hour later we are in the heart of the desert. Hour after hour we speed over the monotonous expanse of bare stony soil. At noon, we halt for an *al fresco* lunch; shortly afterwards the Iraq-Syrian frontier is crossed at a low range of hills known as Jebel Tent. Here the clock goes forward a third hour, and the "rule of the road" changes from the Continental to the British. In view of the large number of cars now using the desert route, the observance of the rule of the road is of more importance than might at first sight appear.

Soon after dark, we reach the fortified post of Rutba, the half-way house of the desert. An excellent dinner is soon ready, and bedrooms with clean sheets for those who are staying the night. Eight other cars arrive within the space of an hour or so. Some cars resume their journey after dinner and drive all through the night, reaching Baghdad the following morning. This, however, is very tiring for the drivers. Some drivers, therefore, prefer to take a few hours' rest and resume their journey at midnight; others a couple of hours before dawn. Two or three cars are supposed to travel together for the sake of security.

The cold of the desert nights is very intense during the winter months; ten or twelve degrees of frost is often registered at Rutba, and I noticed that the motor drivers were careful to empty the radiators of their cars before turning in for the night. The total distance across the desert from Damascus to Baghdad *via* Rutba, is 540 miles; this is covered at an average speed of 30 miles per hour, and speeds of 50 or 55 miles per hour are frequently maintained for long periods. Occasionally the monotony of the journey may be broken by the sight of an Arab camp, or by a chase after gazelle. The Iraq customs post is passed at Ramadi, sixty miles before reaching Baghdad; an hour later we cross the Euphrates by boat-bridge at Faluja. Finally, the Maude Bridge across the Tigris brings us at once into the heart of the ancient city itself.

At Baghdad I was for five days the guest of kind friends, whose courtesy enabled me to visit most of the places of interest in and around the town. What most strikes the stranger on first arrival is the total absence of any available supply of stone suitable for building and road-making purposes. Even such bricks as are locally manufactured are so soft as to be scarcely capable of supporting the weight of a structure two storeys in height. Architecturally, therefore, the city bears little outward evidence of its historic past; few of the existing buildings are more than three or four centuries old, and of the glories of Harun-ul-Rashid nothing remains save the reputed tomb of his favourite wife. A fine new roadway is being

constructed of reinforced concrete, running from north to south through the city, but the side-alleys which open off this roadway are mostly too narrow and winding for any but foot traffic, and the projecting lattices of the upper storeys of the houses often almost meet above the middle of the lanes.

The Iraq railways are similar to the meter-gauge system of India, and the 360 miles from Baghdad to Basra are covered in about twenty hours by the mail train. A dining car is attached to the train, and anyone not possessing a bedding valise can hire from the station-master at Baghdad a kit-bag containing clean sheets, pillows, blankets and *razai*. These are handed back to the guard of the train at the end of the journey.

Leaving Baghdad by the 8.50 a.m. train, it is easy to break journey at Hillah and to spend the afternoon visiting the ruins of Babylon, as laid bare by the excavations of Dr. Koldeway and his staff of German assistants during the fifteen years prior to 1914. The five-mile journey between Hillah and the ruins may be made by hired car, and it is well worth while thus to visit the ancient palace of Nebuchadnezzar, and the supposed Banqueting Hall of Belshazzar, on whose wall the moving hand traced out the fatal message of doom: "*mene, mene tekel upharsin.*" A night in the train brings one to Ur Junction, where there is a rest house with electric light and an Indian *khansama*. The great red *ziggurat* and the mound which represents the ancient city of Ur show up against the western sky-line a mile-and-a-half from the station. Here also, by the courtesy of Dr. and Mrs. Leonard Woolley, I was able to break my journey for a day in order to watch the astounding series of excavations at present in progress, and to observe at first hand the houses, streets, graves, ornaments and literature of the civilized Sumerian nation, which lived here some 3,500 years before the Christian era. The train finally reaches the quayside at Basra at midday, and the B.I.S.N. Co's. weekly steamer leaves on Saturday at 4 p.m., reaching Bombay seven days later.

CONCLUSION.

The journey described above occupied four weeks all but a day. This period might, of course, be somewhat reduced by curtailing some of the various halts for sight-seeing, but this I would not recommend. My tickets for the whole journey from London to Bombay were booked through Messrs. Thos. Cook & Son, of Berkeley Street; and the fares, including sleeping car accommodation for the whole distance from Calais to Aleppo came to £74. To this must be added a further £20 on account of food and hotel expenses incurred during the journey, fees for passport visas, and cost of sending my

heavy luggage round by sea as cargo, to meet me in Bombay. Thus, my total expenses were as nearly as possible equal to the cost of a first-class " A " passage by P. and O.

A few hints on matters of detail may be helpful to those contemplating a similar journey:

(1) Luggage should be strictly limited to such items as can be taken into the railway carriage with one, say a couple of light suitcases. Bedding is unnecessary, ditto solar topee.

(2) If travelling at any time between November and March, bring plenty of warm underclothing and a good overcoat, as the cold is apt to be severe for the greater part of the journey. Between 15th December and the end of January, rain is liable to fall in the Syrian desert and Iraq, and this may disorganize the desert motor services.

(3) If expense is a matter of importance, it is possible to save several pounds by booking second-class instead of first-class on the sleeping car over the sections Trieste-Constantinople and Haidar Pacha-Aleppo. The second-class accommodation is identical in all respects with the first-class, and there is little object in paying the higher fare. On the section Calais-Trieste it is only possible to book first-class sleeping accommodation.

(4) As regards the desert motor service, the Nairn Transport Company charge £20 for a first-class and £13 for a second-class passage from Beyrout to Baghdad; this includes food and hotel accommodation on the journey. Local firms in Beyrout and Baghdad quote £6 to £8 for the same service, but they have no foreign or outside agents, and their passages can only be booked on the spot.

(5) In regard to money, British £1 and 10s. notes are accepted with alacrity everywhere in Europe and the Middle East; 10s. notes are often more convenient than those of the larger denomination. As an additional precaution against theft, money may also be carried in the form of travellers' cheques, which are cashable anywhere, as required.

(6) Passport visas are not required for France, Switzerland or Italy, but are necessary for Yugo-Slavia, Bulgaria, Turkey, Syria, Palestine (if visited) and Iraq. The French language is widely understood in Turkey and generally throughout the journey as far as Damascus.

"SWORDS INTO PLOUGHSHARES."

Being an Account of a Job of Reclamation Work in a Tidal Estuary.

By LT.-COL. T. C. SKINNER, R.E. (retired)

FOLLOWING the War and worse-than-war demobilization, the writer decided in 1921 to take a " busman's holiday " on the Council of the ancient Borough of Pembroke, being returned for Pembroke Ward as ex-servicemen's candidate by a majority sufficient to place the issue beyond risk of a recount. It was the signal for a cleavage in the ranks of the City Fathers, and often in succeeding years did he find to his undoing that majorities within the Council bore no discoverable relationship to those outside.

The times were hard. If Dame Fortune had smiled upon the adjacent dockyard town in war, the fickle jade had forsaken it in peace, and reduction succeeded reduction with such alarming frequency that the problem of finding relief work immediately became acute. It soon, too, became evident that small schemes of improvement, road widenings and such-like, ate up a lot of money with but little to show for it, and in 1923 the call for some more serious undertaking had to be faced.

At the south side of the town existed a swampy valley or common, the local Tom Tiddler's ground, where gypsies contended with borough refuse carts for each inch of firm surface, and children escaping beyond parental beck enjoyed deep but transient satisfaction in the wallows of a turbid stream. Originally it had been a tidal estuary in which, tradition had it, King John once assembled a navy preparatory to a descent on the Irish Coast. Whether that particular outrage was ever perpetrated does not appear, and we need not now concern ourselves with its survival value as an " injustice." Suffice it to know that with a long nose King John signed his Magna Charta, and by the twentieth century the Pen Broke estuary had silted up till it could harbour no greater offence than a toy steamboat ; the real menace was local and bacterial, and had to do, largely, with abattoirs.

For many years back, for centuries indeed, progressive members of the Ward Committee had striven for improvement, but the paramount convenience of being able to find speedy deposit for any and every unwanted thing, invariably tipped the beam against reform ; and such modest proposals as were initiated from time to

time quickly expired for lack of continuity, since for a councillor to touch the Commons was to dig at once the grave of his municipal popularity. One partial improvement did, however, survive in the shape of a pond that had been dug as a collecting basin for flood water, and, round this as nucleus, the writer set himself to frame a comprehensive scheme for reclamation of the entire area as a public park and recreation ground. Not one scheme, however, but nine such, drastically modified, were urged and advocated, before a reluctant council could be induced to back any one of them. It was "Throwing money into a slime pit"; "The Commons had always been flooded and never would be any different," etc., etc.; but, in the end, the progressives won through, eventually securing a loan of £3,360 wherewith to carry out a work that originally called for double that amount. Of this loan, repayable in 30 years, the Government undertook to contribute 75 per cent. of the interest and sinking fund for the first 15, thereby reducing the average burden on the rates throughout the entire period of the loan to about twopence-farthing on the pound.

A start was made on April 6th, 1925, and the park was opened to the public on the 31st July the following year. Expenditure on labour worked out at about £1,200, or the equivalent of a year's steady work for 17 men, in contrast with the brief periods of employment of a like number under earlier schemes. Of the men employed 75 per cent. had served overseas.

As actually carried out the scheme secured for the town a hockey ground and a football field (alternatively cricket pitches for boys), two children's playgrounds, equipped by public subscription with swings, see-saws, "ocean waves" (a species of merry-go-round), sand pits, drinking fountains, and park seats, while sites were levelled for a bowling green, a croquet lawn and five lawn tennis courts. It was hoped that these last three items, being remunerative, would have been added, but the Government grant being less favourable for such, a majority of the Ward Committee voted against, and their construction had to be postponed *sine die*.

The cost of the whole scheme exclusive of playground equipment, worked out as £3,620, implying an excess of £260 on the allotment. Of the excess, however, some £235 had been directly caused by a Ministry of Health alteration of design of the concrete walling *after* the estimate had been approved; from which it will be seen that the work was carried out as planned to within £25 of the estimate—sweet solace to the writer for the pain of keeping a bang-up-to-date record of every penny of commitment and outgoing from start to finish. He had well remembered Lord Kitchener's pardonable pride in having finished the Omdurman Campaign "within the budget," a feat surely unique in the annals of war, and highly to be commended to all R.E. officers in time of peace no less. This happy result could

not have been achieved but for the loyal co-operation of the Council staff, the unfailing support of the best Town Clerk in the world, and the devotion of the works foreman, a mason by trade, whose price was beyond rubies. He had been a "quartermaster" in the Great War.

THE OLD REFLUX VALVE.
(Compare with photograph of the New Valves).

Engineering problems met with in the course of the work, though on a small scale, were extremely interesting. The ancient river bed, traversed in summer throughout the half-mile length under consideration by a small sluggish stream, and heavily flooded in seasons of rain, was crossed at the lower or western end by a road embankment known as Monkton Bridge, the embankment spanning a culvert through which the stream found outlet. The outer end of this culvert had at some time or other been stopped down by a bulkhead of brick in cement carrying a heavy cast-iron reflux valve of 24 inches clear diameter (see Sketch), the purpose of the valve being to exclude the tide at high water while allowing the stream to discharge freely between tides. From the first it was evident that this valve was largely, if not wholly, responsible for the mischief, in that it was of too small capacity to clear all the flood water in the short intervals available, the surplus water backing up inside with cumulative effect from tide to tide till it eventually found easement in overflowing the banks, flooding roads and ground floors of adjacent houses.

The first task, therefore, was to clear out this valve, bulkhead and all, and substitute two large, steel-faced, wooden valves of special design, to give, as nearly as might be, the full cross-sectional value of the culvert, for evacuation of flood water. Not a penny was forthcoming for experiment and it was "sink or swim" from the

start, the new valves having to be designed, built, and provisionally fitted to the outer face of the culvert, before the old could be touched: one had to "put one's shirt on" the design; there was no second chance.

The bulkhead had been built to last, and it took more than a week of "tide work" to cut it out; but, when done, and the new valves had been shipped, the effect was immediate, the whole of the flood water being cleared in less than two hours from the first movement of the valves with the falling tide. Neap tides had, of course, been chosen for the change-over, to minimize the flooding while the bulkhead was being removed, but from that time forward there were no more floods save on one occasion when the bottom valve had been spragged open by a large piece of wood, by whom it was never discovered.

So far good, and the next thing was to design a strainer for the inner end of the culvert, to prevent the valves becoming clogged with debris. Some old fencing standards served for a rough trial to gain ideas, and a grid was then designed, 6 feet high by 12 feet wide, to allow by calculation ample waterway between the vertical bars, *plus* a good margin, with the culvert working full bore. This served well till the leaf came down in autumn when, so great was the glut that ten minutes would suffice to choke the upper half, and some modification had to be sought. The bottom panels were cut out and replaced by portcullises, capable of being raised or lowered at will, but allowing a permanently clear waterway of six inches at the bed of the stream. It was a tough job, involving accurate concrete work under water, but the result was satisfactory.

Next, after everything possible had been done to make the valves watertight on the masonry face, observation disclosed the disquieting fact that many of the springs infesting the upper areas were tidally affected, being at their maximum flow 24 hours after high spring tides; in other words, the tide that had been held up in front, had sneaked round the flank and got in after all. It was a question of quantity, however, and a long series of observations in all weathers and conditions of tide established the fact that the volume of water thus entering was negligible.

Simultaneously, it was found that a strong east wind, blowing outwards through the culvert, tended to hold the valves open to the incoming tide, while a wind from the opposite quarter operated to shut them against the outflowing stream; either effect being to measurably reduce the benefit of the valves. The first trouble was met by attaching counterweights outside to balance the wind pressure; the second proved, like the tidal springs, negligible in effect, the evacuating power of the valves being found ample for every contingency.

Meanwhile the banks of stream and pond were being revetted everywhere with concrete walling, and the areas filled with some 20,000 loads of spoil, carted from Grove Quarry half-a-mile distant. All perennial springs located in the marshes were piped through to the stream, the intermittent ones being effectually sealed over as with a damp-proof course by the spoil from the quarry, locally known as "hog." Bridges were demolished and rebuilt where necessary, to remove obstructions from the waterway, and lock gates were provided for flooding and emptying the pond.

The areas were then enclosed with tubular railings, and the whole levelled and seeded down. It was feared at first that the seed would not take well in the "hog," which was, in effect, "poisoned" soil, but a little basic slag, added before sowing, made all the difference, and the result far exceeded expectation, the area being soon clothed with a good grazing turf which is standing up well against football, etc. Tree-planting is now the order of the day.

Nothing succeeds like success, and nothing could have been more remarkable than the change of public opinion as the work progressed. To have confined the muddy stream within concrete walls, alone made a great impression: this, at any rate, was something to show for the expenditure, while the park seats, that had been discreetly and quite unofficially put into commission immediately on arrival, worked overtime for months in the good cause of propitiating "oldest inhabitants" and weakening the hands of the "die-hards."

The opening day will long be remembered for its glorious sunshine, and the still more glorious "back slapping" of the formal ceremony, ere swings and see-saws were released by generous donors to joyous multitudes, to the strains of the 5th Welsh Band. At night, a fairyland illumination of the pond, and a *feu de joie* of fireworks, by way of farewell to King John, added finishing touches to a four years' campaign *à l'outrance*, from which the chief lesson the writer derived was that the proper study of mankind is man—not engineering.

"SWORDS INTO PLOUGHSHARES."

PEMBROKE COMMONS IMPROVEMENT SCHEME.

The Pill (pool) below Monkton Bridge.
"Such quantities of mud."

The Valves that did the trick.
Half-tide—rising. Lower valve still working.
(N.B.—Arch on outer face is higher than arch of culvert. The dotted circle shows clear section of old valve for comparison.)

Valves

Experimental Strainer of old fencing standards across inner end of culvert. 5 ft. × 4 ft.

Permanent Strainer, 12 ft. × 6 ft., going up in four sections outside the temporary one.

Making a beginning on the Stream.
Going down for Foundations.

Making a Beginning

The Long Reach from Grove Bridge.

The Bend at Rock Terrace.—Fixing Shuttering.

New Way Bridge.—Reconstruction.

New Way Bridge

Filling the Bogs.—One load of 20,000.

Farmer Jones sowing grass seed where once King John's navy rode at anchor.

Back to sea again.
"A life on the ocean wave; a home on the rolling deep."

Back to Sea Again

REUTERS.

Lecture delivered at the School of Military Engineering, Chatham, on Thursday, October 25th, 1928, by SIR RODERICK JONES, K.B.E., *Chairman and Managing Director of Reuters.*

IN your programme the title of the present lecture is given as "Reuters." That title covers a very big subject, and at first sight it is a little difficult to know where just to begin. There is so much that can be said, while the time available for saying it naturally is limited. My difficulty is increased by the fact that you probably do not want to hear merely about Reuters. I imagine that, in addition to being told about the organization and working of one particular agency, you would like to hear something about the collection, the handling, and the dissemination, of that class of intelligence which is called news, as distinct from other classes, military intelligence for example, which often may be most desirable news but for official reasons is not publishable. Consequently, the field confronting me is a wide one, and I cannot hope to cover it either to your or to my own satisfaction. The most I can do is to touch upon it at what seem to me to be conspicuous points, and to leave you to catechize and interrogate me, if subsequently you wish to do so, upon whatever may be obscure. I will begin by telling you something about Reuters, its foundation, its growth, and the lines upon which it is conducted, and after that I shall deal with the general question of news collection and dissemination.

The Agency was started over eighty years ago by Paul Julius Reuter, a young German who came to this country and became a naturalized British subject. There was nothing strange in this. Those were the early days of the Victorian era and the Prince Consort, when the links, personal and other, between Germany and this country, from the Court downwards, were very strong, and when the enmities which more than half-a-century later led up to the Great War were not dreamed of. Julius Reuter was a man of imagination and genius, and he was the first man in this country, indeed, in the world, to envisage the great possibilities of wholesale news collection and its redistribution on a large scale. Reuter was a Jew, and it is interesting to note that the chief collectors and carriers of international news for centuries before belonged to the Semitic race, from the bearers of intelligence in ancient oriental bazaars down to the Fuggers in the time of the Holy Roman Empire, and from then on to the days of

Waterloo, when the Rothschilds, according to the popular legend, scored heavily in their business by obtaining their own advance reports of the progress and outcome of the battle. But the purpose of all these purveyors of information primarily was, not to ensure its publication in the news sheets of the day, but to employ it in the advancement of their financial and trading operations. Indeed, this was Reuter's purpose also when he started. As an enterprising young Bank Clerk in Aix-la-Chapelle, he studied the activities of the various markets as shown in the reports—inevitably belated—which the slow old mail-coach brought from Brussels. As his interest in his hobby grew, it became evident to the young man how valuable the information contained in the reports would be if only he could obtain it before anyone else, and communicate it while it was still up-to-date to the big financiers of the town for use in their deals. He hit upon the idea of employing carrier pigeons to bring him the information speedily from Brussels. Buying a few birds, he arranged with a friend in the capital to release two of them immediately the Bourse closed each day, after having attached to each a little silken bag containing a thin slip of paper on which were written the latest market prices. The young man's scheme worked splendidly. The birds always reached Aix hours ahead of the mail-coach, and the financiers paid him handsomely for the invaluable information with which he was able to supply them. The bank clerk bought more pigeons to extend his business to other Continental centres, and he was quick to realize the possibilities of the first cable between Calais and Dover. He saw himself as a provider not alone of commercial and financial prices and rates for bankers and brokers, but also, through the newspapers, of interesting political and other intelligence for the general public.

Crossing to England, he made London the head office of his business, becoming a naturalized British subject. He began in a very small way of business in Royal Exchange Buildings in the City, and it was some time before he was able to convert the Newspaper Press of this country as a body to his ideas. Once he did, his success was assured, and from then onwards he never looked back. His Agency was conducted more or less as a family affair until 1865. In that year, he sold it to a concern styled Reuters Telegram Company, Limited, of which he had supreme control, and the original deed of sale is one of the most treasured documents in our archives at Reuters. The original capital was £200,000. In later days, it was increased to over half a million, fully paid up. In 1879, Baron Julius de Reuter, as he had now become, retired from the control of the Agency, and he was succeeded by his son, Baron Herbert de Reuter. Shortly after the outbreak of the Great War, Baron Herbert de Reuter died, and I succeeded him. One of my first duties was to reorganize the ownership of Reuters.

As a Joint Stock Company with some 1,200 shareholders, it occupied a vulnerable position. Reuters shares could be freely bought and sold on the Stock Exchange. There was nothing to prevent them falling into hands that would not necessarily be friendly to the Allied cause. It was realized not only by the Board of Reuters, but also, and very seriously, in the highest official quarters as well as amongst the great body of the newspapers, that in a time of national crisis this would be nothing less than a calamity. Consequently I created a private Trust, to be maintained under my own unfettered control, consisting of four well-known public men and myself. We then bought out all the old shareholders, and we vested the ownership of the Agency in this Trust. Though primarily a war measure, the Trust proved so satisfactory as a means of entrenching and safeguarding the control of the Agency that I decided to perpetuate it. The upshot was that three years ago the Press Association of the United Kingdom, jointly with myself, became the Trustees in respect of Reuters for the newspapers of the United Kingdom and, either at my death or upon my retirement, the entire ownership of Reuters will pass, as in large measure it has already passed, into the hands of the British Press. This means that for all time, so far as is humanly possible, the control of Reuters as a national institution is absolutely assured, because, whatever political divisions there may be, and are, between sections of the Press, there can be no doubt of the attitude of the Press as a whole in days of national crisis.

I trouble you with this survey because, although Reuters is entirely an unofficial institution, and has always prided itself upon its absolute independence and its freedom from official as from other influences, it nevertheless does occupy a special position as the principal news agency of the British Empire and indeed as the principal international news agency in the world. This was particularly demonstrated during the War, when Reuters became the main, I might almost say the only, channel for the telegraphic presentation in every part of the globe of the British case from hour to hour and from day to day. The Agency's cable bill during that period ran into several millions. Heavy as it was, it represented only a small percentage of the vast sum spent by the Germans and their Allies in the telegraphic presentation of the enemy case. Thanks to the world-wide extent of the Reuter ramifications, literally from China to Peru, and to the Agency's having at its disposal machinery and channels far more abundant and more efficient than those available to anybody else, thanks also to another reason which I shall mention presently, the British telegraphic propaganda, notwithstanding its substantially lower cost, got the better of the German propaganda more than two years before the War ended.

The reason to which I have just alluded is this. The popular idea, and certainly the foreign idea, of propaganda is that it should be

distinctly tendencious and, on occasion, deliberately misleading. The practical application of that idea in the German propaganda, which in other respects was conducted with ability as well as with energy and lavish expenditure, was largely responsible, first for its relative ineffectiveness, and then for its failure. The British telegraphic propaganda, on the other hand, was conducted on the principle of telling the truth, even when the truth might be unpalatable to ourselves. When I say this, I am speaking more especially of the telegraphic services that were compiled and dispatched by Reuters, which I should think represented 90% or more of the whole. The penetrating influence of these Services in foreign countries all over the world excited the envy and provoked the anger not only of the German authorities but also of the German people, and by the end of the War the name of Reuter was both hated and respected throughout Central Europe. During the third year of the War, a German submarine succeeded in cutting one of the British cables, the only one, thanks to the vigilance of the British Navy, that the Germans ever managed to tamper with. When the British repair ship subsequently picked up the ends of the cable to piece them together again, attached to one of them was found a bottle in which was a slip of paper bearing the words: "This is the work of U Number 4, and puts a stop to Reuters' damned anti-German work." It was in the same year that the famous German humorous weekly, *Kladderadatsch*, devoted its entire number, from cover to cover, both illustrations and letterpress, to a satirical and enraged attack upon Reuters.

From first to last, these special Reuter services were conducted in the interests of the State without any sort or kind of official dictation or official interference. The authorities in general, and the Foreign Office in particular, had the wisdom to recognize that Reuters' reputation for accuracy and impartiality was a thing that could be turned to very good account in all parts of the world. They perceived that where an official propaganda, however well disguised, would come under suspicion and be ineffectual, reports going forth from Reuters or under the Reuter name would be accepted and believed. Fortunately they also realized that this would hold good only so long as the Reuter telegraphic services to different parts of the Empire and to foreign lands continued fully to be trusted by the newspapers and by the public for whom they were designed. This process of reasoning led inevitably to the conclusion that the whole business of handling these vast news services should be left entirely in the hands of Reuters, who, as a British institution, must be trusted to do what was best for the Allied cause. It is the fashion from time to time to abuse Governments and Government Departments for their supposed poverty of imagination, no less than for their lack of business sense, and, above all, common sense. I am glad to be in a position to quote from my own personal experience a striking proof that this abuse is

not always justified. In the Reuter case those concerned, Cabinet Ministers and officials alike, displayed imagination, common sense, and business acumen.

I have delivered a number of lectures and speeches on news questions during the last few years, but I have never before dealt so specifically with Reuters' functions and position during the War. I present the facts for the first time now to you because it seems to me that, as military men, presumably with wars ahead of you, they may have a special interest. And I would not have you think, when I speak of the freedom and discretion that were left to Reuters in the present case, that I am one of those who believe in freedom from a censorship in military matters. On the contrary, in my judgment, such a censorship not only is desirable but is absolutely indispensable, especially in or near a theatre of hostilities. The issues at stake in a campaign often are so serious, the consequences of information reaching the enemy, or even neutrals, can be so grave, that the military authorities are entitled, indeed they are under an obligation, to exercise the most strict supervision over whatever news goes forth, especially from the actual seat of war, of a direct and even of an indirect military character. This view is one to which, I believe, all responsible directors of news organizations, and all responsible correspondents, will subscribe. We who deal in news dislike censorships as such. They always are an inconvenience, they frequently are a nuisance, and more often than not they fail completely in their purpose. In certain parts of Europe, censorships are to-day being enforced which are tyrannical and grotesque in their working, and mischievous in their consequences. If attempted anywhere in the British Empire they would produce a riot. But there is all the difference between such censorships and the reasonable and intelligent control over news relating to military affairs to which, during a campaign, and especially during a time of national peril, the men who are fighting for their country, whether on land or at sea, and indeed the country itself, are entitled. You will observe that I use the words "reasonable and intelligent" in relation to the control exercised. Those qualifying adjectives are necessary. Where a censorship is exercised unreasonably and without intelligence, however justifiable in principle the censorship may be, it is bound to cause irritation and to excite the opposition of correspondents, the agencies, and the newspapers, and ultimately to defeat what should be one of the principal aims of a sagacious and prudent censorship, namely, to secure and to maintain the sympathetic and spontaneous co-operation of the Pressa nd itsr epresentatives. During the last War. that co-operation generally existed. There were exceptions, especially in distant and isolated areas, but, for the most part, after making due allowance for human fallibility, the censorships at various points worked smoothly and on the whole were rational.

It would be hypocritical on my part to suggest that the keen and adventurous correspondent, eager to do his best for his agency or his newspaper, submits to a censorship without a pang. Military censorship in its modern and more methodical form has reduced greatly the scope and opportunities for the exercise of individual resource and enterprise. What in journalism we call "scoops" are less frequent, and certainly less dramatic than they were in former days. I daresay some of you know the story of Archibald Forbes, the celebrated war correspondent of the *Daily News*. He had just witnessed one of the opening battles of the Franco-Prussian War, I forget for the moment which. The nearest telegraph office was miles away. There was a single operator and a single line. Forbes had competitors. Whoever got his message on to the line first could hold the line until the message was finished. There was a wild race on horseback across country for the telegraph office. Forbes laboured under a disadvantage. One at least of his rivals had prepared a message. Forbes had not written a line. If this rival got his message into the operator's hands first Forbes was done. Forbes spurred on his horse and reached the telegraph office three or four lengths in front of the others. He had a pocket Bible. Seizing telegraph forms, he pinned on to them the opening pages of the Book of Genesis, and commanded the operator to signal them on to London. When the message began to arrive, the men at the *Daily News* office thought Forbes had gone out of his mind. But when, about the middle of the first chapter of Genesis, the biblical narrative passed abruptly into a vivid description of what had been a great battle, they realized what he had done, and the *Daily News* next morning scored a memorable success over all its contemporaries. A modern censorship would have made such a brilliant stroke impossible.

Some of you possibly may recall another story, one for which Reuters was responsible. At 9.15 in the evening of Friday, May 19th, 1900, Reuters published a message from South Africa announcing that Mafeking had been relieved. The Reuter telegram was read from the steps of the Mansion House by the Lord Mayor, and a copy also was sent at once to Queen Victoria and the Prime Minister. In a few minutes, special editions of the evening papers spread the news like wildfire, and almost instantaneously London was in the throes of a jubilant and boisterous demonstration which resulted in the coining of the word "mafficking." Time went by and no official confirmation of the Relief arrived. Towards midnight, Mr. Chamberlain was pressed in the House of Commons for information. He had to admit that he had none. But he added that he had every confidence in Reuters' accuracy. The process of mafficking went on through the night. Saturday dawned and wore on into afternoon, still without any confirmation, official or unofficial, being received. Lord Roberts, then in command in South Africa, was cabled to. Still no official confirm-

ation. The authorities and the newspapers began to be uneasy. I will not disguise from you that those in charge of Reuters were uneasy too. They had every confidence in their man, a tried and trusted correspondent. But had there been some awful mistake?

On the Sunday morning, Lord Roberts had sufficient faith in the Agency to have the Reuter telegram, which had been cabled back to South Africa from London, read to the troops on church parade at Bloemfontein, where the Commander-in-Chief was then stationed. Eventually confirmation came. The explanation of the mystery was that Reuters had received the news from a correspondent of theirs who had managed to persuade the Boers to let him remain on their side. The Boers knew that Mafeking was relieved before the British did because the British relieving force was very far from its base, and for a time out of telegraphic touch. The Reuter correspondent rushed the news out through the neutral Portuguese territory, and got it on to the Eastern Telegraph Company's cable at Lourenço Marques a couple of days before anybody else. Meanwhile, it took the same two days for the British in Mafeking and the relieving column to get their reports through to the British side. Hence the anomaly of people in South Africa having first to learn from, and for two days to be solely dependent upon, a Reuter telegram from London for news of a momentous event that had happened in South Africa itself. The correspondent, I may say, was a Scotsman!

No news organization ever received a higher compliment than that for more than two days, without official confirmation, and without any corroboration from any other source, the whole of the British Empire should have celebrated the Relief of Mafeking entirely upon Reuters' word. Not less striking were the tributes repeatedly paid it during the Great War. A certain Reuter message was held up by the authorities, though the same message was published elsewhere. There were good reasons for withholding the news. But Reuters naturally asked why there should be this discrimination against them. The answer was, "Because if this news is published under Reuters' name people will believe it."

I think I can say with all modesty that this belief in the reliability of Reuter reports is almost universal. In the Far East, so high does the Agency's reputation stand for accuracy that the word "Reuter" is used by the Chinese in their own tongue as a synonym for truth. And, when I was in Peking three or four years ago, the then Prime Minister informed me that Reuters' foreign dispatches were so trusted in China that the historian whom he had appointed to compile the Official History of China for the closing years of the Manchu Dynasty and for the opening years of the Republic was relying primarily for his record of international affairs upon these dispatches, of which complete files had been kept in the State archives in Peking for three decades.

Speaking of China reminds me of an incident that occurred shortly before I arrived there. For a whole day the Shanghai Cotton Exchanges, the most important in the Far East, suspended operations because, owing to a cable breakdown, Reuters' Cotton advices from abroad had not come to hand. The merchants for twenty-four hours refused to deal, in the absence of the standard by which they were accustomed to check their transactions. For nearly half-a-century all over the East and Far East, Reuters has been either the only service of news, or, as in recent years, the dominant and paramount service. The Reuter commodity, metal, financial and other prices are the standard by which business is done from one end of the East to the other, in Bombay, Calcutta, Karachi, Madras, Singapore, Batavia, Hongkong, Shanghai, Hankow, Tientsin, Osaka, Tokio, and in many another mart. To the Continent of Europe Reuters conduct the most complete and most trusted of all international news and commercial services circulating there. In addition to their continuous telegraphic and telephonic services they make over a hundred wireless broadcasts every day. The importance to this country of such an extensive dissemination, especially of financial and commercial intelligence, whether in Europe or in other parts of the world, is so obvious that it need not be dwelt upon. All over Europe, since the institution of the Reuter wireless service, business people are being fed with British reports for all kinds of commercial and financial business, where formerly they had New York, Paris, Hamburg, Berlin and other reports. The tendency consequently is for these people more and more to turn to the United Kingdom to conduct their transactions. Not wishing to weary you, I will quote only one illustration. Recently the Czechoslovak Press Bureau announced that, in consequence of Reuters' frequent and regular supply of quotations, the Czechoslovak textile industry was now dealing directly with the United Kingdom, instead of purchasing its cotton through Bremen.

You may now like me to give you some idea of how news is collected and distributed. From Julius de Reuter's small beginnings the news agency system has become a vastly important and an indispensable part of the mechanism of journalism as we know it to-day. Under that system, practically every square mile of the earth's surface is covered for news purposes at a minimum of cost. To illustrate what I mean, I will describe Reuters' part in that system. In each country in the world, without one exception, where news agencies exist the principal news agency, or the sole news agency in countries where there is only one, is affiliated to Reuters by long-term covenants. In France, for instance, we have the Havas Agency, in Germany the Wolff Agency, in Italy "Stefani," in Spain "Fabra," and so on throughout Europe; in the United States we have the Associated Press of America, and in other foreign countries a score more. In each of these countries, starting with all the countries of Europe and

going right round the globe by way of India, the Dutch East Indies, China and Japan, the United States and South America, the whole Continent of Africa, from Egypt and Algeria to the Cape of Good Hope, the whole of Australasia and Canada, and the rest of the Empire, Reuters' agents and correspondents are established, and not only do they have at their disposal the news which they and their staffs assemble, but they also have the first and the exclusive call upon the news garnered by the affiliated agencies. That news, after having been sifted and examined by our own people, is passed by cable and by wireless to the Reuter headquarters in London, where it is sifted again and then is re-transmitted to every part of the globe, either under the Reuter name, as in Africa, North, South, East and West, in Australia, in New Zealand, in India, in Malaya, the Dutch East Indies, China, and in various other countries ; or else under the name of the affiliated organizations in their respective countries as part of their own services. Long practice and experience have shown that this process of assembling news at one great centre and then distributing it to the whole world is cheaper and swifter than any other. For instance, a regular service of news between India and America can be conducted at present more swiftly and more cheaply by way of London than direct between India and America. In the ordinary course, people suppose that the greater the distance between two points the correspondingly greater the time required to bridge that distance. That is true as a rule in all things except telegraphy. It takes much longer to travel from London to Melbourne than it does from London to Edinburgh. But the distance and time factors do not bear the same relation to each other when we come to telegraphy. A telegram may reach Melbourne or Wellington, N.Z., from London much more quickly than a telegram will reach Edinburgh or even Brixton, from London. When one gets this fixed in one's mind, one is less affected than one otherwise would be by considerations of distance when contemplating the transmission of news. The efficiency of the route, and the amount of traffic on the route, are elements far more important than the element of distance. By virtue of this Reuter system of pooling the news of the whole world in London, and of smaller agency combinations which have grown up beside it, London has become the principal news clearing house of the world, and a maximum of output has been secured with a minimum of expenditure. Yet the annual costs of the Reuter combination of agencies alone are estimated at over five millions sterling per annum, and this sum takes no account of what is spent by news agencies outside the Reuter alliance. I mention these figures merely to give you an idea of the extent and magnitude of the activities of only one section of the men who labour in the news fields of the world.

The responsibility resting upon these men increases year by year.

By no means their least important task is to interpret the people of one country to the people of another. Upon their interpretation depends very largely the creation of good feeling or of ill. And not upon interpretation alone. In the mere selection and objective recording of events a correspondent can influence the mind of his readers. If from any particular country tales of nothing but drink and banditry go forth, while 90% of the news, mostly good, is ignored, the rest of the world cannot be blamed for coming to the conclusion that that country is largely peopled by thugs and vagabonds. I give an exaggerated example in order to illustrate the point I wish to make. It is that as much care and thought need to be devoted by correspondents to the mere selection and objective presentation of news as to its interpretation. And when we come to the handling of political and international news, these men more and more have the peace of the world in their keeping, a fact that has been emphasized repeatedly during the last few years in my own hearing, and often publicly, by Foreign Ministers, including our own, and by other public men, in almost every country that I have visited. In so far as correspondents portray the daily life and the activities of the people of one country faithfully to the people of other countries, they help to break down the barriers which divide the nations from each other, and they contribute to the creation of better international understanding and to the promotion of peace. In the newspaper of to-day news swamps and overshadows ideas. The journalism of ideas, the journalism of our grandparents, of our parents, and even of our youth, has given way to the journalism of information.

The night before I last left New York, I was the guest of honour at a private dinner at which a number of distinguished Americans were present. In supporting the toast Mr. Elihu Root, now a very old man and perhaps the most respected of all living Americans, delivered a striking speech, in which, drawing upon the wealth of his own long experience and shrewd observation, he enlarged upon this theme. Subsequently, in response to a desire I expressed for an epitome of Mr. Elihu Root's views in his own words, that gentleman wrote:

> "The substance of the idea which I tried to express was that, with the extraordinary growth of news service in recent years, the public in all civilized countries has been acquiring the habit of being informed from day to day about what is going on in the world, and this habit has greatly changed the basis of political action by the great self-governing democracies. For a long time I have been observing evidences of this effect in American political life. The American voters were formerly moved very largely by stump speeches and strongly partisan editorials, and by what they were told concerning public events in the course of whirlwind campaigns immediately before election. To-day, as a rule, new

IN CLOUDS ON THE MISCHABEL.

Strahlhorn. Rimpfischhn. Mte. Rosa. Südlenzspitze. Nadelhorn. Stecknadelhorn. Hohberghorn. Dürrenhorn.
Hohbahlen Glacier. Ried Glacier.

THE MISCHABEL GROUP FROM THE NORTH.

Taken from the Ulrichshorn.

The Mischabel Group

Nadelhorn and Südlenzspitze from Stecknadelhorn.

Südlenzspitze, showing the great gendarme on the left.

Sudlenzspitze

ice was soft enough for these to bite into it, but Rex and I did not possess them, and we got more and more uncomfortable on that glassy slope, on which even our well-nailed boots felt like skates. "No time to cut steps," shouted Ignaz from behind, "go straight down; I'll hold you." So I led straight down and the inevitable happened. My feet shot from under me; the point of my ice-axe hardly made any impression as a brake, and I dragged Rex off his insecure foothold on the ice and went to the full extent of the rope. Ignaz saw it coming, dug his *crampons* in, and was as good as his word and held us. A tiring and slippery progress took us down at last, and across a *bergschrund* to a big snow-covered crevasse at the bottom of the slope. Ignaz shouted to me to glissade over this, there being some safety in speed on the principle of the mat bridge. The snow was, however, too sticky to glissade, but I sprawled across; Rex dropped one leg through, but the other foot was luckily on firm ice and he heaved himself out without checking a moment. Away we went at speed across the Ried glacier, towards the foot of the ice slope leading up to the *col* between the Dürrenhorn and the Hohberghorn. This year the foot of this *col* was guarded by a formidable *bergschrund*, a good hundred feet deep and presenting about 10 feet of vertical ice wall on the far side of a snow bridge. Ignaz wielded his axe with all his might and every blow was a shrewd one, but it took him twenty minutes to cut steps over this obstacle, and this provided a welcome rest for Rex and me.

A couple dozen more ice steps took us to the rocks of the Dürrenhorn, and nasty loose stuff they were. We climbed up quickly but carefully in order to avoid sending down stones on to climbers below, for we were followed by another party of a guide and two Germans. One of these was the gentleman who liked the window shut, so relations between the parties were somewhat strained! We got to the *col* at 11.30 a.m., dumped our rucksacks and ice-axes and set off along the narrow rock ridge to the Dürrenhorn. When Ignaz traverses a ridge, he does so religiously and takes everything humanly possible direct, and the last three little gendarmes provided a pleasant scramble. The other party took the easy path just below the crest, by which, having satisfied honour on the way up, we returned to the *col* for a short halt and food.

We were now well embarked on our ridge climb and, seeing us so committed, an icy wind came up with a snow storm and all view was gone for the rest of the day. It is a long pull up to the Hohberghorn, rocks most of the way, but at one point we had to climb up and across the top of an ice *couloir* which fell away like a funnel on the south side of the *arête*. The wind blew the snow up this *couloir* furiously and numbed our extremities, while Ignaz was hacking away with his ice-axe. We got to the top of the Hohberghorn at 1.30 p.m. —an hour-and-a-half after leaving the Dürrenhorn, and set off

immediately down the other side, which was easy snow and provided a welcome relief.

The whole of this ridge is a knife-edge, its northern flank being steep ice, and its southern flank a precipice of broken rock. Unfortunately, we had no view, and the pace at which we went effectively prevented us from realizing how sensational the climb might be. We were all three moving together practically the whole time. The elaborate precautions, belays, etc., taken in the Lakes and Wales, would have delayed us impossibly long. It was an occasion for that mutual confidence and team work, which is one of the greatest pleasures of mountaineering. The management of the rope is an intricate, continuous and complicated business for the middle man, especially at such a pace, and Rex worked wonders that day.

The Stecknadelhorn was passed almost without our noticing it, for the storm was at its fiercest, and we scrambled breathlessly on with only a couple of minutes' halt, reaching the Nadelhorn at 3.30 p.m., one-and-a-half hours before schedule time. Here we had a very welcome quarter-of-an-hour's rest and then set off down the same *arête* we had descended the day before. But new snow up to three feet in depth had entirely transformed it, and the way down was by no means so clear. On the snow at the bottom the mist was very thick, and ridge and precipice, snow and fog were almost indistinguishable. We staggered wearily into the hut at 5.15 p.m. to find that, except for the guide and the two Germans who followed us, we were the only party who had been out at all that day. Several cups of hot tea and the remains of our provisions revived us considerably, and we set off again in the sleet and rain at six and quietly dropped down our 5,000 feet to Saas Fee, where a kindly head waiter provided two tired, dirty and unshaven men with a very excellent dinner in defiance of all rules about late arrivals.

Next day, to spite us, the sun shone gloriously on the Mischabel; still, the northern ridges of the group had been defeated. But then, I know only one thing which will make Ignaz turn back on a mountain and that is a thunderstorm, and the Mischabel had not used that weapon.

NAVY, ARMY AND AIR FORCE INSTITUTES, GIBRALTAR.

By MAJOR H. E. COAD, S.R.E.S.

THE foundation-stone for the new premises of the N.A.A.F.I., Gibraltar, was laid in July, 1926, by His Excellency General Sir Charles C. Monro, Bt., G.C.B., G.C.S.I., G.C.M.G., the Governor, and the building was finished a year later. The design is of two storeys, and Spanish bricks 12 ins. x 6 ins. x 1¼ ins. are used for the 12 in. thick walls which have piers 2 ft. square at 10 ft. centres, carrying the rolled steel joists of the upper floor and the steel roof trusses above. The exterior is cement rendered with ornamental string courses and lines, the piers showing on the outside as columns. The roof is of rough boarding covered with two-ply felt and grey asbestos slates.

The accommodation provided consists, on the ground floor, of a large bakery, refrigerating plant, engine room, refrigerating chambers, mineral water factory, grocery issue store and a store for naval groceries. On the upper floor are the flour store, furniture department, general store room, and offices for the Staff. Communication between the two floors is by a marble staircase at the main entrance, an electric lift, a wood staircase with sack chute in the issue store and an exterior cast-iron spiral staircase.

The first floor is constructed of concrete, reinforced with expanded metal, carried on rolled steel joists. Beams and columns are encased in expanded metal and plaster. The ground floor is of concrete. For the main part the building may be termed fireproof; the only fire appliances provided are buckets and Minimax Extinguishers, but fire hydrants are available in the vicinity.

The cost of the building worked out at approximately 10½d. per foot-cube. This price includes drainage and ejector plant, boundary wall, refrigerator chambers, but not refrigerating plant, mineral water machinery or bakery plant. A great deal of tiling both on walls and floors is included in the price, which is considered a very reasonable one.

The especial points of interest in the building are the foundation work, the drainage, the bakery, the refrigerator plant, and the mineral water factory.

Foundations.—The site of the building is land reclaimed about thirty years ago from the sea. It lies about 40 yards inside a substantial quay wall.

The usual trial holes were dug to a depth of 3 ft. below the bottom level of the foundations. A good hard subsoil was exposed which was considered firm enough to carry the super-imposed load of ·6 tons per square foot without danger of subsidence. Owing to the uncertain nature of the site, the widths of the foundations had been designed at 5 ft. under the piers and 4 ft. under the intermediate walling, in order to bring the pressure on the subsoil to a low figure.

The foundation trenches were dug out and, on the whole, appeared satisfactory. Before laying the concrete bed, the drainage ejector pit was excavated. This had been sited at a point about 50 yards further away from the sea and was 6 feet deeper than the building foundations. It was at once evident that there was a soft stratum about 4 ft. below the latter. The whole of the trenches were accordingly tested by driving a Norton Well Tube at 15 feet intervals. In some cases, the tube sank too easily for safety. It was accordingly decided to pile, and 50 heavy 4-in. cast-iron pipes were driven down to solid rock, which was found 10 feet below the trenches. These piles were shod with a loose conical cast-iron point and driven with a 3-cwt. monkey running on a length of $1\frac{1}{4}$-in. galvanized water-tubing set inside the pipe, on the same principle as the Norton Well apparatus. A heavy lead washer was used to deaden the impact of the monkey and all the piles were successfully driven. The piles were filled with concrete and connected to the concrete foundation with 4 lengths of $\frac{1}{2}$-in. round bar passed down the pipe and bent at right-angles. The foundations, which were already designed to be reinforced with expanded steel, were further strengthened over the piles by two lengths of Decauville rail laid laterally.

The whole of this extra work cost £125, and, as there have been no settlement cracks, the method may be deemed satisfactory as well as economical.

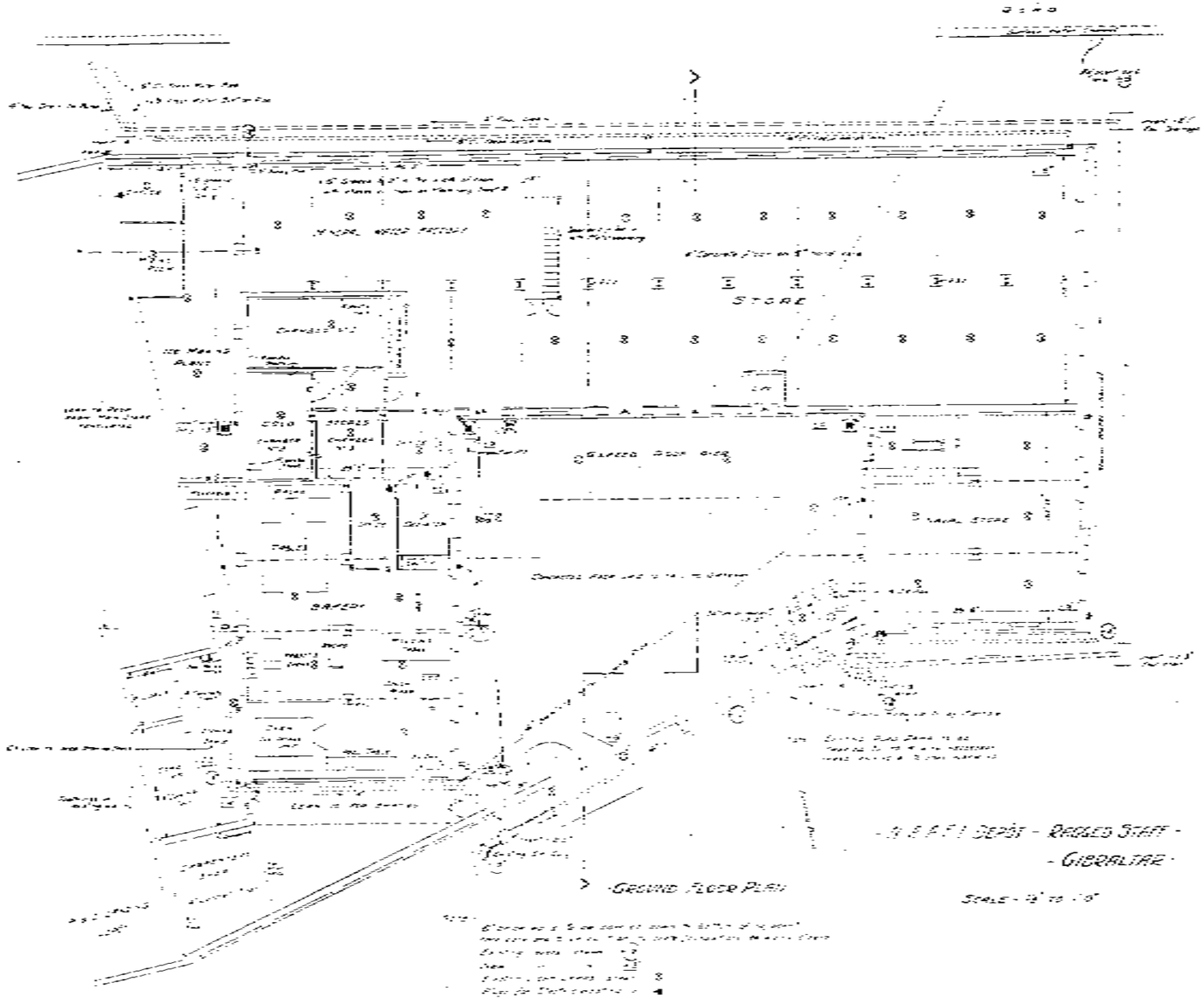
Drainage.—The building is below the level of the main sewerage system and a sewage lift had accordingly to be arranged. A 2-in. Flexala centrifugal pump from the Pulsometer Engineering Co., with a rubber covered impeller and rubber vanes was used. The cast-iron cover of this pump has spiral grooves on the inner face into which solids are pushed by the vanes, which, being of rubber, bend and pass over the obstruction. The solids are then swept by the rush of water into the delivery pipe. The pump has an automatic starting panel with a float switch. Up to the present it has worked without any attention, at a cost of about 1s. 6d. per week for 13 drainage points—W.C.s, lavatory basins, etc.

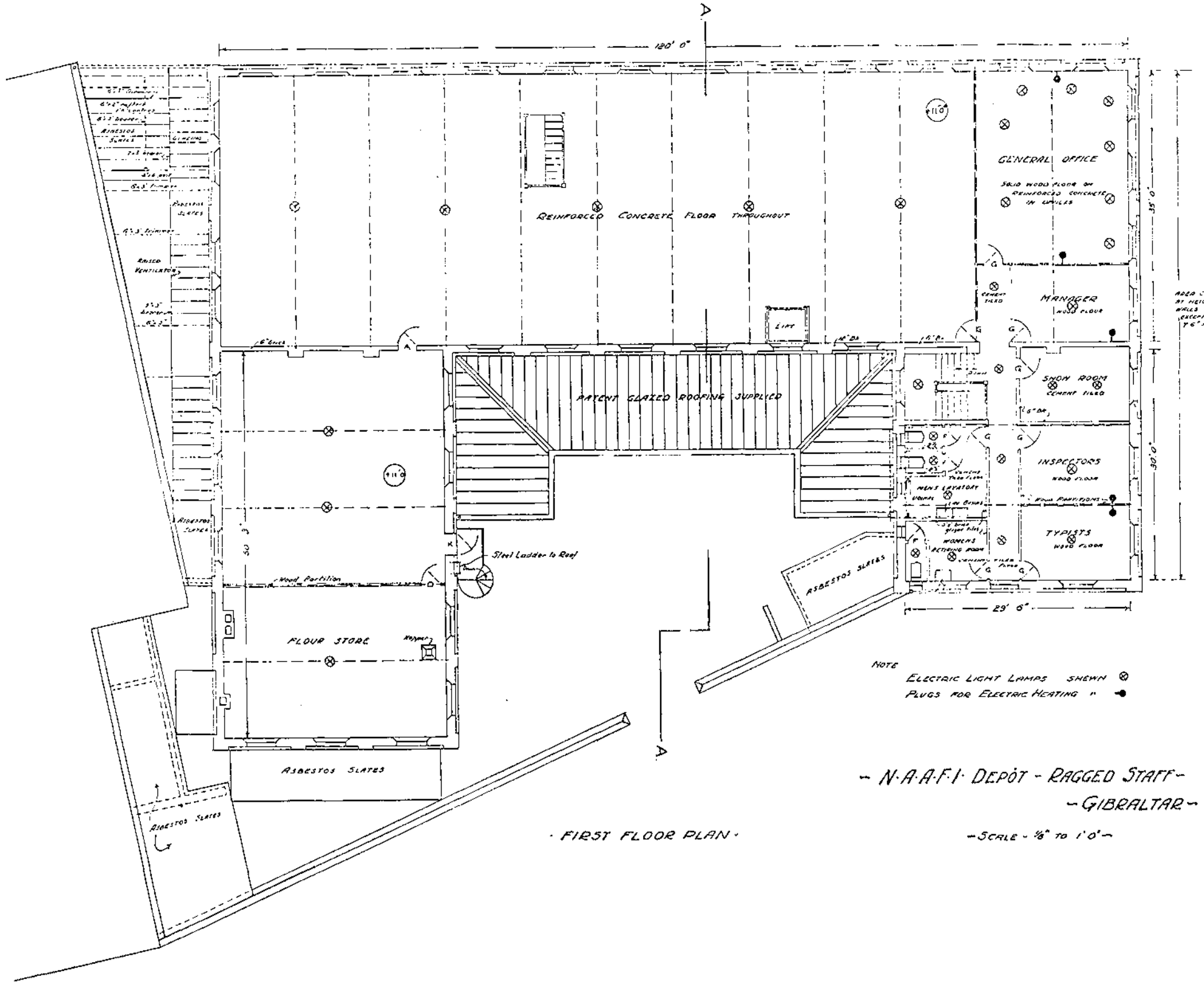
Front View

NAAFI Gibraltar

Back View.

NAAFI Gibraltar


STORE
- R.A.F.I. DEPOT - ROYAL STAFF -
- GIBRALTAR -
GROUND FLOOR PLAN
SCALE - 1/8" TO 1'-0"



NOTE

ELECTRIC LIGHT LAMPS SHEWN ⊗

PLUGS FOR ELECTRIC HEATING " ●

- FIRST FLOOR PLAN -

- N.A.A.F.I. DEPÔT - RAGGED STAFF -
- GIBRALTAR -

- SCALE - ⅛" TO 1'0" -

Bakery.—Efficient ventilation and cleanliness are ensured by large windows and ventilators and high glazed tiled dados and tiled floors. The double-deck, 8 ft. x 6 ft. Collin's baking oven has external furnaces which eliminate furnace dust and most of the heat from the bakery. Flour is fed from the flour loft through a mechanical sifter into the dough mixer, where it is mixed with warm water from the temperating tank. The dough container is then wheeled away to the loaf-making table and an empty container placed in position.

In addition to the Collin's oven, there are two Mabbots' pastry ovens, a mechanical pastry mixer, a pastry roller and cutter, mincer and bun divider, coffee roaster and grinder, all run from separate motors.

Refrigerator.—The chambers, which are sited in the coolest part of the building, are constructed of brick walls rendered, lined with two layers of 3-in. thick pressed, granulated cork slabs, breaking joint, laid and backed in bitumen. The floor and ceiling are similarly treated. The internal finish consists of a tiled floor and cement rendered surfaces on the walls. The cubic capacity of the chambers is 3,700 cubic ft.

The machinery consists of an ammonia compressor with two cylinders, 4-in. diam. and 4-in. stroke, arranged for direct coupling to an electric motor of 12 B.H.P. The condenser is of double-pipe type, 2-in. and 1¼-in. bore. Each chamber has brine tanks with solid-drawn ammonia expansion piping electrically welded and built into grids. Air fans are used for air circulation. An ice tank for 24/54 lb. ice blocks is installed outside the chambers.

Mineral Water Factory.—The fresh water used for minerals is collected from the roofs of the warehouse and led through 6-in. and 4-in. heavy cast-iron pipes to a large concrete tank of 98,000 gallons capacity, from whence it is pumped by a small electrical pump, through 1½-in. galvanized water pipes to tanks above the mineral water factory, passing through filters on the way. Direct supply from these tanks to each machine is given. The machines consist of gas generator and gasometer, bottle washer with jets and brushes for cleaning six bottles simultaneously, syruper, filling machines, syphon filler and corking machines, all run by belting and shafting from a 7 H.P. dynamo. Special protection had to be given to the brickwork near the gas generator, as it was found that the gases decomposed the cement mortar, causing the tiles to fall off the walls. This was effected by fixing a lead apron of 5-lb. lead to the wall behind the generator.

THE WORK OF A MECHANIZED FIELD COMPANY DURING DIVISIONAL TRAINING.

By LIEUT. J. C. R. FITZGERALD-LOMBARD, R.E.

THE 17th Field Company, which has been mechanized, normally works with the Armoured Force, but during the 3rd Divisional Training this year the Armoured Force was broken up, and this company worked with the 3rd Division. As it is possible that other field companies may be mechanized in the near future, an account of this work may be of interest. The training took place on Salisbury Plain from the 10th–13th September. Roughly, the troops were divided into a Southern Force, consisting of two Infantry Brigades, two companies of tanks and one of armoured cars, two Brigades of Field Artillery and two Field Companies, and a Northern Force, in which were a cavalry brigade, two battalions of mechanized infantry, one company of armoured cars, one brigade of field artillery, and a field troop R.E. The Northern Force, though smaller and more mixed, was thus far more mobile than the Southern, but the latter could count on support from an imaginary brigade—supposed to be detraining at Andover. The Southern Force was being sent up to extend the left flank of the main army, and was given as objective the high ground overlooking the Pewsey Vale, whilst the Northern Force were to deny this and to threaten the Southern communications with Andover.

As regards R.E., the Northern Force, as already mentioned, had nothing but a field troop from Aldershot, whereas the Southern Force had the 17th and 54th Field Companies, and a Field Park Company improvised from the 17th Field Company bridging equipment, and some extra vehicles and stores. We thus get a mechanized field company working with a non-mechanized company in a non-mechanized force against an enemy who were partly mechanized and wholly mobile. This gave a very interesting opportunity for studying the advantages of mechanization as regards R.E. work, and we were fortunate in that the C.R.E. gave us plenty of work, so that we could display these advantages.

On this occasion Lieut. Clarke commanded the 17th Field Company and Lieut.-Colonel Martel was acting as C.R.E.

For those who do not already know it, a mechanized field company in peace consists of four sections, each of two light six-wheel lorries carrying twelve men each, and one six-wheel tool lorry per half-

company. A compressor and some power tools are to be kept at present at company headquarters, and sent out to sections as required, though, when we know more about their capabilities, they may be included in the section equipment. Company headquarters has a six-wheel reconnaissance car, and the usual vehicles, such as water lorry and cooks' lorry. The bridging equipment of the improvised Field Park Company was organized in four sections, and since all bridging operations were dependent on this company, it is worth while considering it in detail. The first two sections each consisted of two medium six-wheel lorries and trailers and a medium lorry with ordinary body. Each six-wheeler and trailer carried two pontoons and one bay of medium superstructure, whilst the other lorry carried the third bay of superstructure and the shore ends. Each section could thus construct three bays of medium bridge. No. 3 Section had two kapok rafts for ferrying any loads up to three tons—one carried on a Morris "Carrymore" eight-wheeler, and one on a medium six-wheeler, and in addition a lorry carrying stores for converting one of the medium bridges into a heavy bridge if desired. The fourth section consisted of three light lorries—hired from civilian firms for the occasion—each carrying 104 ft. of kapok assault bridge.

The bridging capabilities of this company for the operations may thus be summarized as 63 ft. of heavy bridge, 63 ft. of medium bridge, two kapok rafts, and 312 ft. of assault bridging.

The present scale of bridging equipment carried by a Field Park Company comprises (*a*) trestle equipment, sufficient to make alternatively 63 ft. of medium bridge or 42 ft. of heavy bridge, and (*b*) 416 ft. of kapok assault bridge. It was assumed that the additional equipment necessary to complete the total carried in this instance had been allotted from the Pontoon Bridge Park.

Operations were timed to start at 1500 hours on September 11th, and at that time the Southern Force was in a bivouac area near Weyhill, whilst the Northern Force was near Market Lavington. The Southern Force advanced in two brigade columns towards the Avon. The 54th Company were allotted to the left column, but the right column only had a section of the 17th Company—in fact, up to about 2000 hours there was only a reconnaissance party—the remainder of the company and the Field Park Company being kept back near Division H.Q. The C.R.E. knew that it could be sent up immediately where required, and he would have done the same thing with the 54th Company had it been mechanized.

Briefly, the narrative of the operations was as follows. Both columns advanced, meeting armoured cars and cavalry patrols, but neither encountered any serious opposition. On reaching the River Avon, it was found that all bridges between Upavon and Netheravon inclusive had been destroyed. The left column, however, succeeded in securing a bridge at "C" Crossing, and crossed the

river that evening ; the right column forced a passage across the river near Netheravon early in the morning on the 11th. During the morning of the 11th, the advance was continued, and the Northern mobile force again harried and delayed the progress of the Southern Force. At this stage the Southern Force Commander anticipated that the enemy might endeavour to carry out a turning movement round his left flank, and he therefore destroyed all bridges at and south of Bulford, and ordered reconnaissances to be carried out with a view to establishing a line of communication further north. The Southern Force reached their objective on the high ground overlooking the Pewsey Vale early on the 12th. It was now found that the Northern Force, who had only been fighting a weak delaying action, were concentrating about Shrewton. Southern Force were preparing to move their communications further north, when the Southern Force Commander received the information that the detrainment of the imaginary infantry brigade at Andover had been delayed 24 hours owing to bombing, and that consequently he was to secure the high ground west of Upavon and to move his line of communication with Andover further north in order to shorten it. This was done during the afternoon of the 12th, but late that evening he received information that the advance of this brigade was cancelled altogether, and that he was to withdraw on Andover. The movement was commenced at daybreak next day, and by noon, his troops being near Tidworth, operations were concluded.

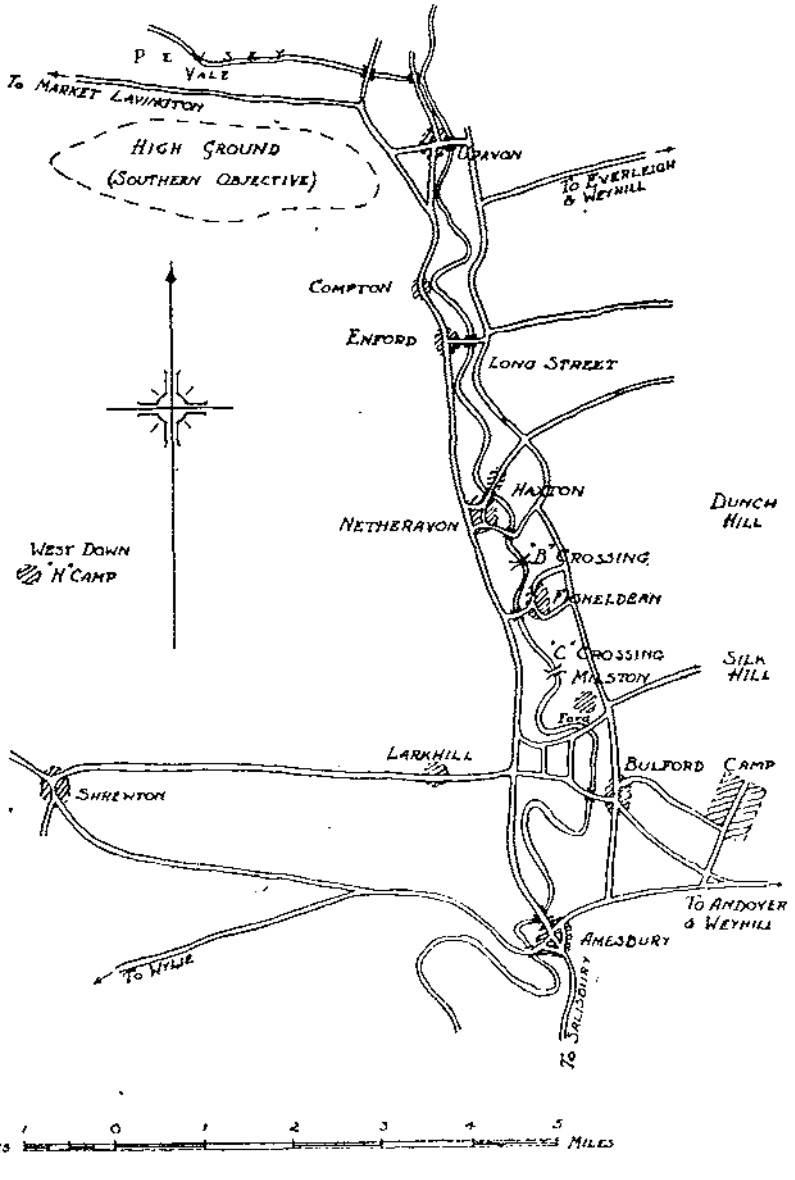
As far as R.E. work is concerned, these operations may be divided into three phases, the advance, the movement of the line of communication, and the withdrawal.

Considering the first of these, the 54th Company had little to do, except water supply, since the left column reached the Avon just in time to save the bridge from demolition, and crossed at once. The company were thus unable to use the assault bridges, which had been sent up to them that evening.

The advanced section of the 17th Company, however, handed over assault bridges to the right column, and these were used, on the morning of the 11th, by the Duke of Wellington's Regiment to cross near " B " Crossing.

A little later, they used a kapok raft, and the machine-guns and a light battery were rafted over to support the leading troops and enable them to enlarge the bridgehead.

The pontoon bridging equipment had been kept back near Divisional Headquarters, about four miles from the river, and, at 0730 hours, orders were issued for the construction of a medium bridge near " B " Crossing. The remainder of the 17th Field Company were sent forward with No. 1 Section of the bridging equipment from the Field Park Company, and they moved cross-country direct to " B " Crossing. Work on the bridge construction started at 0830 hours,



3RD DIVISIONAL EXERCISE

MAP SHOWING CROSSINGS OVER RIVER AVON

and the bridge, which consisted of three bays of medium bridge on two medium pontoon piers, was completed by 0855 hours. The remainder of the right column crossed by this bridge during the morning.

The position was now that the South Force was advancing over the river with a heavy bridge at " C " Crossing (an existing bridge that had not been demolished) and a medium pontoon bridge at " B " Crossing. In order to make the position more secure, the demolished bridges at Haxton and Figheldean were ordered to be repaired. This was carried out theoretically by using pontoon superstructure on timber trestles, and both bridges were passed by the umpires as open by 1130 hours. Haxton bridge was repaired by one section from 17th Field Company, and Figheldean by 54th Field Company. 54th Company now advanced with the left column and one section 17th Company with the right column, leaving the remainder of this company in the hands of the C.R.E.

Turning now to the second phase, the 17th Field Company sent two sections to demolish the bridges at Bulford and Amesbury, and to crater Hilston Ford as a protection against a turning movement by the enemy. This work was completed by 1330 hours on the 11th. A reconnaissance of the river to the north was made with a view to moving the lines of communication in that direction.

On the 12th, this movement took place. The 17th Field Company prepared for the demolition and demolished in turn " C " Crossing and Figheldean Bridge, and early in the afternoon they constructed a heavy bridge at Longstreet. This consisted of three bays of superstructure on two timber trestles, which were made by bolting together two sides of a tank stepping stone. The bridge took half-an-hour to construct, and a company of tanks passed over as soon as the bridge was ready. The medium pontoon bridge at " B " Crossing was then picked up, and Haxton bridge prepared for demolition. It will thus be seen that a *minimum* of two bridges was always available for use during this movement of the line of communications northwards. In this period the work of the 17th Field Company was scattered over an area about eight miles in length, and could not possibly have been done in this time by an unmechanized unit. The 54th Field Company had meanwhile been busy with water supply arrangements, and had erected a water point for the 9th Brigade at West Down North Camp, and, later, another at Compton Farm.

In the withdrawal which was ordered on the 13th, the 17th Company prepared the bridges at Upavon, Enford, and Longstreet for demolition, and blew them up after all troops had crossed, whilst the 54th Company destroyed the bridge at Haxton, which had previously been prepared for demolition by the 17th Company. All demolition parties had rejoined their units by 0900 hours on the 13th, and soon afterwards operations were brought to a close.

The operations provided a thorough test for the company vehicles. When the company was first mechanized—nearly three years ago—there were many alternative suggestions for the type of vehicle to be adopted, such as half-track lorries, and larger and more powerful vehicles, but the trials have so far completely justified the selection of the light six-wheel lorry as the standard vehicle for a mechanized field company. The question has arisen as to whether two Morris "Carrymores" would not be better than a Guy and trailer for carrying the double pontoon and bay of superstructure. In these operations the Guys ran very well, and were able to go where required, but the impossibility of backing them, except by manhandling the trailers, should not be forgotten.

The lack of a mechanized cooker, which is not yet available for mechanized units, was particularly in evidence on the first day. The 54th Company arrived at the assembly point about three-quarters-of-an-hour after us, and yet had dinners going within about a quarter-of-an-hour; whereas it took us about two hours from our time of arrival to light fires and get the dinners cooked. As regards the tool lorries, the one provided with a derrick proved its usefulness at Enford by pulling out a refractory gate-post when we were clearing a way to the heavy bridge. The arrangement and contents of these lorries left little to be desired—they contained all the tools we wanted, stored in accessible positions.

The heavy bridge at Enford, over which a company of tanks passed, provided a good test for the timber trestles. They were used in a shallow river with a firm bottom, and were very successful—showing no tendency to capsize. The bridge, however, is rather too narrow for tanks, which, unless steered absolutely straight, fouled and broke the racking chains. Tanks had to cross dead slow at as constant a speed as possible, and it was necessary to employ a maintenance party of six men looking after racking chains and stiffeners while they were crossing.

In general, the advantages of a mechanized company stood out prominently. Besides rapidity of movement from one place to another, mechanization enabled the C.R.E. to keep the company near Division H.Q. from which sections could be sent out on jobs, such as demolishing or repairing a bridge, at short notice as required. On completion, the section rejoined the company, and was immediately available for another job if required. This procedure would be difficult—if not impossible—with a non-mechanized company, and this is exemplified if a comparison is made of the bridging and demolition work done by the two field companies in these operations.

SHAKESPEARE AND ELIZABETHAN WAR PROPAGANDA.

By COL. B. R. WARD, C.M.G., Hon. Secretary, "The Shakespeare Fellowship."

THE Elizabethan era was admittedly great both in arts and arms, culminating, as regards the former, in Shakespeare, and, as regards the latter, in the naval victory of 1588. An intimate bond unites the Elizabethan dramatists with the Spanish War; but this has not been hitherto suspected, chiefly because the earliest Shakespeare quarto was not published until 1593, five years after the defeat of the Armada.

Froude originally designed his famous history to extend from the commencement of the personal rule of Henry VIII. to the death of Elizabeth. The title he eventually decided on was *A History of England from the Fall of Wolsey to the Defeat of the Spanish Armada.* One result of this change of plan on his part has been to convey the impression that the war against Philip II. ended in a clap of thunder in 1588, and that during the remaining fifteen years of Elizabeth's reign the country was in the enjoyment of peace and quiet. Nothing could be further from the truth.

"The Shakespeare Fellowship," founded six years ago with the object of carrying out research work, in order to throw light on the many Shakespeare problems that still await solution, has for the last three years extended the field of its researches so as to include the general history of the time. Literary problems, we have found, cannot be studied apart from questions of social environment; and the results of our investigation will, we believe, throw a new and interesting light on a period which has been hitherto much misunderstood.

When Queen Elizabeth came to the throne she inherited an empty treasury, a debased coinage, a war with France, and a realm torn asunder by the bitter controversy between Lutheranism and Catholicism. Her first step was to conclude a treaty of peace with France; her second was to dissolve the religious controversy by the compromise known as the Elizabethan Religious Settlement; her third was to restore the currency; and her fourth was to replenish the Exchequer.

For the first twenty-seven years of her reign, England enjoyed almost unbroken peace, and in its wake followed prosperity. During

the same period, the rival monarchies of France and Spain underwent a much less fortunate destiny. France was being gradually suffocated into bankruptcy by an interminable series of religious civil wars; and Spain was steadily squandering her vast resources in a vain attempt to subdue the rebellious Dutch burghers. All this time, Elizabeth and her Lord Treasurer watched, prepared, and waited. At length, when they judged the moment ripe, they threw down the challenge to the Spanish giant.

Early in 1585, the Queen received an embassy from the Dutch Republic, and agreed to send over a Royal Army of 4,000 men to co-operate with them against the Spaniards. In August, this little expeditionary force landed in Holland, with the Earl of Oxford as General of the Horse, and Sir John Norris as Colonel of the Foot. Six weeks later, Lord Oxford was unexpectedly and mysteriously recalled; and in December, the Earl of Leicester, at the head of a large body of reinforcements, took over supreme command as Lieutenant-General of Her Majesty's Army in the Low Countries.

It was in no light-hearted spirit that the Queen and Lord Burghley entered into a death-struggle with Spain. For years they had employed every diplomatic device to postpone the declaration of war; but, once the issue was joined, they prosecuted the war with the utmost vigour and determination. It is impossible here to give even the barest outline of the naval and military operations that took place during the ensuing seventeen years. But an attempt will be made to indicate a few parallels between the effect of the war on the Elizabethan civil population and our own experiences in 1914–18.

From 1558 to 1588 taxation had remained at a fairly constant level. In 1589 it was doubled, in 1597 it was trebled, and in 1601 it was quadrupled. This approximates closely to our own recent experiences, with a pre-war budget of about £200,000,000 and a post-war budget of about £800,000,000.

Between 1593 and 1596, the price of wheat was very nearly trebled, and in the latter year the scarcity of foodstuffs amounted almost to a famine. Once again this corresponds closely to the rise in prices between 1914 and 1917, and to the critical food shortage in the latter year. No one who remembers the bread queues during the Great War would probably deny that crushing taxation, soaring food prices, and even the threat of scarcity, are the surest and quickest means of undermining the morale of the civilian population. From the parallels I have drawn, we may be quite sure that the burdens and tribulations of our Elizabethan ancestors were not a whit less than those we underwent in 1914–18.

During the seventeen years that the war lasted, the annual direct expenditure on the Army and Navy alone exceeded 80 per cent. of the total revenue of the country on no fewer than seven occasions;

and at the time of the Armada crisis—1587 and 1588—the figures are 95 per cent. and 101 per cent. respectively. In one year only —1595—did the naval and military expenditure drop below 50 per cent. of the revenue. These figures, moreover, do not take into consideration extraordinary expenditure due indirectly to the war.

Over and above the direct and indirect cost of the war, the Queen had to maintain the normal routine expenses of running the Court and Country. The Chamber, the Household, Gentlemen Pensioners, Civil Servants' salaries, the Office of Works, etc., etc., all had to be kept going. When we realize that the average annual cost of maintaining all these multifarious services was less than £100,000, we begin to understand why it is that Elizabeth has acquired such a reputation for economy and thrift. Between 1585 and 1602, the war expenditure multiplied itself by four ; but during the same period the salaries and pensions of Civil Servants and Crown dependants fell from over £20,000 a year to £14,000 a year. And this in the face of ever rising food prices.

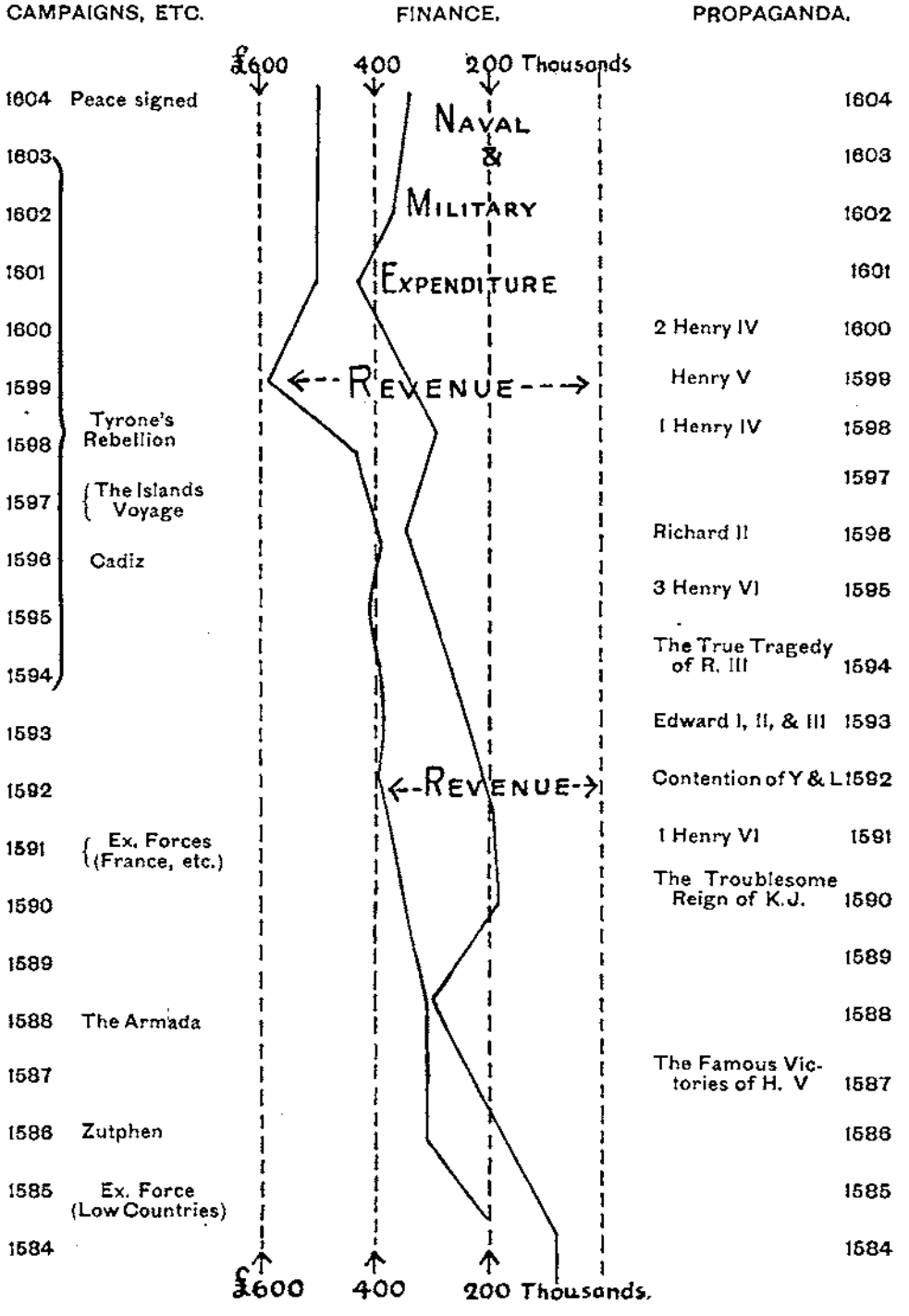
Truly it was no light load that Queen Elizabeth imposed upon her subjects at home. There were no war-bonuses in those days. Every penny that could be scraped together went to satisfy the ever-increasing demands of the Army and Navy.

It is probably true to say that one of the gravest concerns of our Cabinet during the War with Germany was how to prevent the gradual demoralization of the home front. Germany's defeat was largely due to the eventual collapse of the civil population under the intolerable strain they had to bear. The ultimate defeat of the Spaniards by the England of Elizabeth was due in no small measure to the fact that the morale of the overburdened tax-paying peasants of Castile completely broke down, and their once fertile valleys became desolate wildernesses. Why did King Philip fail where Elizabeth succeeded? Why did the Spanish home front collapse while ours held firm?

There was probably little to choose, in the sixteenth century, between the sturdiness of Spanish and English stock ; there was, perhaps, not very much difference between the burden each nation had to bear ; and, even if we assume Elizabeth's superior genius for economy, we must also admit that Philip II. was very far from being recklessly extravagant. Perhaps the real secret of Elizabeth's success lay in her appreciation of the needs of the home front, and in the genius she exercised in holding together and inspiring her war-worn subjects, who were labouring under so great a strain of taxation, high prices, and scarcity.

Let us examine a few of the incidents in the opening days of our own Great War, and see how they may be paralleled with similar happenings in the early months of the Elizabethan struggle.

ANGLO-SPANISH WAR, 1585—1604.



On 7th August, 1914, three days after the declaration of war, the Press Bureau was established by Lord Kitchener, with Lord Birkenhead as its first Director. The censoring of undesirable news was the first and most important of its duties. Shortly afterwards it was found that Government control of a positive kind was also necessary if the morale of the nation was to be maintained. A War Propaganda Bureau was accordingly set up by the Prime Minister. In February, 1918, this Bureau was enlarged by the appointment of Lord Northcliffe to the important position of Director of Propaganda in Enemy Countries. Combined with the voluntary work of the great newspapers, these two public departments of censorship and propaganda exercised, throughout the War, a continuous and effective pressure on public opinion at home and abroad.

During the opening stages of the Elizabethan War we may well imagine that administrative action similar to that taken in 1914 may have been necessary; and, indeed, we find this to be the case. The Earl of Oxford had not been more than six weeks in the Low Countries before he was recalled by the Queen's orders, and the Earl of Leicester appointed to the command. It seems probable that the Queen had come to the conclusion that the home front was more likely to provide opportunities for his special talents than a military command overseas. It was in October, 1585, that he was recalled; and the war had only lasted eight months when the Queen took the identical two steps that were taken in 1914 by Lord Kitchener and the Prime Minister.

Having found that too much liberty given to the printing press was causing grave inconveniences, she empowered Archbishop Whitgift and the Privy Council to draw up rules regarding printing. A Star Chamber decree was accordingly issued on 23rd June, 1586, of which the following were the principal provisions:

1. Every printer in possession of a press was ordered to report details to the Wardens of the Stationers' Company within ten days.
2. Printing was only to be allowed in London, Oxford and Cambridge. Presses were to be examined periodically by the Stationers' Company.
3. No one was allowed to print any book, work, copy, matter or thing whatsoever until it had first been seen and perused by the Archbishop of Canterbury or the Bishop of London. The only exception to this rule was made in favour of the Queen's printer, who might carry out any duties specially ordered by Her Majesty or the Privy Council.
4. Nothing was to be printed against the form or meaning of any restraint or ordinance contained in any statute or law of the realm, or against the true intent and meaning of any letters patent, commissions, or prohibitions under the Great Seal of England.

It is clear from the foregoing that the Queen realized that in time of war it was more than ever necessary for the Government to exercise a severe and rigid control over the printing press.

Just as in the Great War a Press Bureau for censorship duties was shortly followed by a Propaganda Bureau for disseminating information calculated to encourage loyalty to the Government and patriotic feeling, so we find within three days of the issue of the Star Chamber decree, which detailed pains and penalties that would follow any infringement of censorship regulations, that a Privy Seal Warrant was signed by the Queen granting "to Our right trustie and right welbeloved Cousyn the Earle of Oxford" a payment of £1,000 yearly. The wording of this warrant was couched in the same phraseology as that employed in the case of secret service money, the Exchequer officials being expressly forbidden to call for any account as to its expenditure. We know, moreover, that it was granted for some State service because it is not included with the ordinary annuities in Part I of the Exchequer accounts, but is entered in Part XIII, which consists of payments to the heads of the various State departments. And Lord Oxford received the grant regularly from 1586 to 1604—a period which corresponds exactly with the duration of the Anglo-Spanish War.

It seems reasonable to suppose that this grant was made for the same purpose as that effected by the establishment of the Propaganda Department in the Great War. In Elizabethan days there were no newspapers, and public opinion was influenced partly by the issue of authorized Government pamphlets, or mainly—since reading was a rare accomplishment—by Government control of stage plays, particularly by the exploitation of the now famous Elizabethan historical dramas.

It has been recognized for a long time that a remarkable unanimity of style and sentiment can be traced in the work of the dramatists of the fifteen-nineties—*e.g.* Shakespeare, Marlowe, Peel, etc.—but the cause of this widespread unanimity has been a puzzle. It is not difficult for us, with the experience of the Great War behind us, to see that this unanimity of thought behind the printed dramas of the Spanish War period was almost certainly due to some form of Government control. In time of war, the individuality and independence of the subject have to be subordinated to the needs of the nation; the Elizabethan dramatists were, in effect, employed on a most important branch of national service at home.

All through the first part of her reign the Queen had shown, by her frequent progresses through the country, the importance she attached to personal contact as a means of influencing public opinion in favour of her authority. In time of war, no doubt, she found it desirable to supplement this personal propaganda by the use of mass suggestion, effected mainly by means of the stage. Miss Clemence

Dane, in her fine play, *Will Shakespeare*, first acted in November, 1921, correctly sensed the situation in the scene which represents the Queen giving Shakespeare instructions as to his work:

Elizabeth. I send my ships where ships have never sailed,
To break the barriers and make wide the ways
For the after world.
Send you your ships to the hidden lands of the soul,
To break the barriers and make plain the ways
Between man and man.

This scene is symbolically true. Shakespeare stands for all the dramatists of the war period, acting under the impulse given by the Queen through her chosen representative the Earl of Oxford.

An instance of how Lord Oxford carried out the Queen's secret instructions may be seen from the following example. On 3rd February, 1594, the Privy Council wrote as follows to the Lord Mayor of London:

To our very good L. mr. Alderman Buckle, L. Maior of the Citie of London.

For restraint of playes.

After our very hartie commendations to your L. Whearas certein infourmation is given that very great multitudes of all sorts of people do daylie frequent and resort to common playes lately again set vp in & about London, whearby it is vpon good cause feared that the dangerous infection of the plague, by Gods great mercy and goodnes well slaked, may again very dangerously encrease and break foorth. . . . Wee thearfore thought it very expedient to require your L. foorthwith to take strait order that thear bee no more publique playes or enterludes exercised by any Compaine whatsoever within the compas of five miles distance from London, till vpon better lykelyhood and assurance of health farther direction may bee giuen from vs to the contrary.

Your L. very louing friends,

Io : Cant. Io : Puckering. C. Howard.
Th. Buckhurst. R. Cecyll. I. Fortescue.

As a general rule, the Lord Mayor and Aldermen of London required no prompting from the Privy Council to induce them to exercise their authority in restraint of plays. They were only too ready to snatch at any opportunity to stop these performances, hateful as they were to the Puritan element in the population and also to employers of labour who looked upon stage plays as an encouragement to idle apprentices to shirk their work. It should also be noted that an important member of the Council—Lord Burghley—was not one of those who signed this letter to the Lord Mayor.

Now, on 7th July, 1594—just five months later—the Earl of Oxford wrote as follows to his father-in-law, Lord Burghley:

> My very good Lord:
>
> If it please you to remember that about half a year or thereabout past, I was a suitor to your Lordship for your favour: that, whereas I found sundry abuses whereby both Her Majesty and myself were in my office greatly hindered, that it might please your Lordship that I might find such favour from you that I might have the same redressed. . . . In which doing I shall think myself singularly beholden in this, as I have been in other respects. This 7th of July.
>
> Your Lordship's ever to command.
>
> EDWARD OXENFORD.

It seems probable that Oxford was here protesting that his stage propaganda work was suffering owing to the action of the Privy Council, a body from whom he would naturally expect support and not hindrance against the inveterate hostility of the City authorities.

In 1604, while the peace negotiations with Spain were in progress, the Earl of Oxford died The preceding eighteen years had witnessed a remarkable vogue for the war-like chronicle play; Marlowe, Shakespeare, and other dramatists whose names have not come down to us, all contributing their quota. And, with the conclusion of peace, this vogue for historical drama ceased as suddenly as it had begun. Does it not follow that these plays represent, in the main, Elizabethan war propaganda as far as the stage is concerned?

After all, it is not very extraordinary to find that Queen Elizabeth subsidized and utilized the drama in this way. She herself was passionately devoted to plays; and there seems no reason to doubt that she would fully appreciate the propaganda value of the stage in the days before newspapers and wireless. The following examples give some idea of the range of war-like propaganda to be found in the Chronicle plays:

1. The invincibility of English arms is dealt with in the *Famous Victories*, *Henry V.*, and *Edward I.*
2. The encouragement of patriotism and anti-Catholicism are dealt with in the *Troublesome Reign* and *King John.*
3. The fate of disloyalty is shown by the execution of the regicide Mortimer in the last scene of *Edward II.*
4. Loyalty to the reigning house—(the Tudors sprang from the House of Lancaster)—is dealt with by exalting the Lancastrians and vilifying the Yorkists in the *Contention*, the *True Tragedy*, *Henry VI.*, and *Richard III.*

5. The inevitable fate of rebels is exemplified by the collapse of Cade's rebellion in *Henry VI.*
6. Anti-Spanish propaganda is the main theme of *Edward I.*

These instances are by no means exhaustive; nor is it suggested that these plays are wholly concerned with propaganda. The primary object of the plays was to interest, amuse, and entertain. The propaganda *motifs* are, as it were, slipped in quite casually. And it is significant that the direct propaganda appeals are usually to be found in the first and last scenes, where they obviously would have the greatest effect on the audiences. It is not, of course, suggested that all these plays necessarily emanated from Lord Oxford's department of State; his task, as head of such a department, would more probably have been to encourage dramatists to write plays of a patriotic character.

An interesting example of the use of the stage for subversive propaganda occurs in the following well-known story. It is said that the deposition scene in *Richard II.*—a scene which caused Elizabeth to exclaim: "Do you not know that I am Richard II.?" was not part of the original play, but was specially written and acted at the instigation of Lord Southampton just before the Essex rising.

When we compare the Elizabethan stage during the Spanish War with our own during the Great War, it is curious to find a very close parallel in the case of two favourite soldier characters. Old Bill, as a representative of the men affectionately known as "the Old Contemptibles," is characteristically an English hero by the very absence of the obviously heroic virtues. None the less is he the best-known symbol of the finest Army that ever left our shores. Falstaff in the same way represents one of the many captains whose deeds have been mostly forgotten, but who carried on the professional soldierly tradition, under Lord Oxford's famous cousins, the "Fighting Veres," his brother-in-law the "Brave Lord Willoughby," and his old colleague-in-arms, Sir John Norris. Falstaff himself—as we now know from Mr. John Dawtrey's book, *The Falstaff Saga*—had a flesh-and-blood prototype in a fine—though corpulent—soldier, Captain Nicholas Dawtrey, who did excellent work in preparing the levies in 1588, and who died on active service in Ireland in 1601. Falstaff is just as much the heroic Elizabethan captain as Old Bill is the heroic soldier of the retreat from Mons. Their foibles and humours were never intended to detract from their sterling qualities. We laugh at and with them, but we love them all the same; recognizing that they are kindly caricatures of men whose virtue, in the Roman sense, was real and solid. Nor does the parallel between Old Bill and Falstaff finish with their war-time adventures. Shortly after 1918, a play was produced in London called *The Better 'Ole.*

This play represented Old Bill, demobilized and back again in the bosom of his family, as the happy and contented proprietor of a public house. And there is a well known tradition that about 1602 (when the Spanish War was virtually over) Queen Elizabeth expressed a desire to see Falstaff in love, and that Shakespeare obliged her by writing *The Merry Wives of Windsor*, which represented Old Jack back once more amongst the bar-maids of Windsor.

To sum up. When we remember the perils threatening England from Spain and the Pope on the one hand, and the doubtful succession issue on the other, is it not quite natural that Elizabeth should, in 1586, have conceived the idea of a secretly subsidized State department to assist and control the public theatres, in order that her subjects might not only be encouraged by such spectacles as English victories over foreign nations and a successful revolt against the tyranny of the Pope, but also that it might be brought home to them that loyalty to the anointed sovereign inevitably triumphed over the forces of rebellion?

At any rate, Lord Oxford was given £1,000 a year of public money from 1586 to 1604; and, considering how severe and continuous was the financial pressure throughout the whole period, we may be quite confident that the Queen would never have authorized so large a grant every year from the depleted Exchequer unless she had been thoroughly convinced of the high value of the services rendered by the Propaganda Department. After all, it is not difficult for us to hold the same conviction when we picture how electrified the audiences at the inn-yards and theatres must have been as they listened to the ringing message contained in the closing lines of the anonymous play, *The Troublesome Reign of King John*:

> If England's peers and people join in one,
> Nor Pope, nor France, nor Spain, can do them wrong.

Or, as Shakespeare put it:

> Come the three corners of the world in arms,
> And we shall shock them. Nought shall make us rue,
> If England to itself do stand but true.

THE FASTNET CUP RACE, 1928.

By CAPTAIN B. E. C. DIXON, M.C., R.E.

As the Yacht Club had received a special grant from the Corps Games Fund towards expenses for the Ocean Race, it was decided that *Ilex* should be entered for the race as usual. No new gear was considered necessary, as a new set of head-sails had had to be purchased after last year's Ocean Race and she was well fitted out last winter. The mainsail, though old, was considered to be strong enough for the race, though it was hoped that similar weather to last year would not be encountered, as it certainly seemed doubtful whether the sail would stand up to it.

Ilex went to Portsmouth on 5th August and, as usual, was scrubbed down and everything put ship-shape by Carter, prior to the crew joining her the day before the race. The crew, consisting of D. N. B. Hunt (*skipper*), D. R. Crone, B. E. C. Dixon, M. T. L. Wilkinson, F. J. P. Gibson, T. W. R. Haycraft and H. S. Francis, joined at Portsmouth on Tuesday, 14th August, and sailed to Cowes, practising taking down a reef on the way.

On 15th August, the crew were up early stowing ship and getting up sail. It was a perfect morning, with a light westerly wind which freshened considerably by 11.30 a.m., the hour fixed for the start of the race. Anchor was weighed at 10.45 and, with full light weather canvas and spinnaker set, Hunt made an excellent start, crossing the line a few seconds after the gun, leading the fleet of the remaining eleven starters by nearly a quarter-of-a-mile. *Ilex* retained the lead for some time by keeping in close to the shore and avoiding the tide. Near Ryde, the wind backed till nearly abeam, and *Nina* and *Mohawk*, the two American schooners, went through our weather as we handed the spinnaker.

By 2.15, we were close hauled on the starboard tack with a fresh wind and choppy sea, and memories of last year's race came to us as we started a dead beat down Channel. *Jolie Brise*, *L'Oiseau Bleu* and *Neptune* soon passed us to leeward. *Nina*, who was pointing up like a racing cutter, was going very fast; and *L'Oiseau Bleu*, from whom we were only getting twenty minutes, looked very dangerous. As the afternoon wore on the fleet spread out, and we settled down for the 600-mile trip. Some of the crew at this stage were feeling by no means happy, but by Thursday morning all had got their sea legs, and there was no further sea-sickness. Hunt divided the crew into two four-hour watches with two dog watches. This was found to be a great improvement on previous years, as it meant a comfortable berth for those off watch.

At 4.30 p.m., Wilkinson was asked to put his weight on to the topsail sheet. He did so with such effect that the starboard topmast shroud parted, and the topmast and topsail yard crashed towards the deck. *Ilex* was put about and hove to on the port tack to clear the wreckage, the job taking about an hour—sixty minutes of good time wasted, and only plain sail for the rest of the race, unless something could be done.

By 6.35 p.m., we were nearly abeam of the Needles on the starboard tack, and, with a good steady breeze, remained on this tack throughout the night. About 8 p.m., *Lassie* crossed our bows a few cables ahead and shortly after went round on to the starboard tack. She was not carrying a topsail and we learnt afterwards that her topmast had sprung off Bembridge Ledge.

At dawn on Thursday, we were out of sight of land, holding a southerly course on the starboard tack, and it was not until 2 p.m., when the wind, which had now fallen to a light breeze, had backed, that we went about heading into the land.

The previous evening we had got the heel of the topmast down on deck and found that it had broken straight across at the cap, leaving seven feet below, and about ten feet of good wood above the fracture. The topmast shroud, which had parted near the top, looked quite sound, and we therefore had some seventeen feet of good timber and enough wire to stay a shorter topmast if we could rig one. Many suggestions were made during the morning, but none seemed practicable, until Francis, who was below off watch, suddenly decided that he could make a scarf joint if the necessary tools were available. Carter produced them like a magician, and Francis set to work, assisted by the advice of the remainder of the crew. By the evening the topmast was joined by an excellent double-scarf joint, held together by long coach screws and binding wire, and was only about three feet shorter than before it snapped. Doubts about its standing up to its work were expressed, but it was decided that it should be tried, though not until the morrow, as night was falling and it would take some time to hoist it and get all its gear into working order.

By 10 p.m., the Eddystone light was nearly abeam with the Lizard light bearing by account, W. by N., about 42 miles distant. The course was now west, the wind having veered a point or so and, being very light, and the tide against us, we made very slow progress.

Daylight on Friday morning found us barely moving through the water, with the Lizard well forward of the beam. Two of the crew bathed and, after breakfast, the task of setting the repaired topmast was tackled in earnest. We went about on to the port tack, course N.N.W., the Lizard bearing W.N.W., and proceeded to hoist the topmast. By 11.45 the topmast was in position, shrouds shortened and the jib topsail was set. After that came the question

of setting the jib header, and our skipper produced the bright idea of using the jackyard for the extra hoist necessary, due to the shortened topmast. The jib header was, therefore, lashed to the spar and, by 12.20 p.m., it was set as a club topsail, and it was unanimously agreed that it had never set so well.

By 2.30 the Lizard was abeam and we signalled to the station and learnt that *Nina* had passed the night before, and *Jolie Brise* and *Mohawk* that morning. As we could see *Lassie* well south of us and only slightly ahead, we were very pleased with ourselves. We learnt after the race that *Jolie Brise* was becalmed in Mounts Bay nearly all that day.

About 3 p.m., the wind fell right away and we were motionless, except for a slight fair tide, for nearly an hour during which time all the crew bathed. A light wind then sprang up enabling us to lay our course W.N.W., a point free. As the breeze was very light, Hunt decided to test topmast still further by setting the yankee jib. This was done and the joints showed no signs of weakening, and, after setting the balloon staysail, we soon left the Lizard astern.

By 8 p.m., the wind was abeam; sheets were checked and the sheet leads of yankee jib and balloon staysail were boomed out, giving a much better set. At 9.30, Crone, our expert navigator, checked the compass by star azimuth, and found the deviation to be half-a-point west of the course, and at 11.45, when the Longships light opened, he fixed our position from the Lizard, Wolf and Longships.

At nightfall, the wind dropped and, later, a light breeze off the land, causing us to gybe, carried us slowly across Mounts Bay through a maze of lights, the Penzance fishing fleet at anchor, and shortly after one o'clock we were abeam of the Runnelstone.

Early on Saturday morning the wind veered to the S.E. and we gybed on to the port gybe and set the spinnaker. *Lassie* was about a mile away on our starboard bow and, though at first we went up on her, she went away later on in the morning. It was a glorious day with enough wind to keep us going well. The crew, feeling energetic, set the working staysail as a mizzen spinnaker, using the topsail yard as the boom. This was not considered a success, as *Lassie* appeared to leave us after it was set, and it was handed after much discussion.

At noon, our navigator fixed us and showed us further south than we expected. The course was therefore altered to N.W.$\frac{3}{4}$W.—our log read 41$\frac{1}{4}$. Two hours later the wind veered, spinnaker was handed, and the yankee jib and balloon staysail were once more boomed out.

By the end of one of the most glorious days imaginable, we were drifting through a calm sea about four miles astern of *Lassie*. The barometer, however, was falling fairly fast and more wind was

prophesied. This prophecy was soon fulfilled, for the wind freshened considerably, and at 1 a.m. we had to hand the yankee jib for fear of our repaired topmast. No. 1 jib was set and with a beam wind and a smooth sea, we were soon going like a train. Just before daylight we ran into filthy weather and, though visibility for a time was very poor, we saw the starboard light of a boat passing us about a quarter-of-a-mile to leeward. She was going at a tremendous pace and we came to the conclusion after the race that she was *Neptune*.

At 5.10 a.m. the log read 141, showing that we had been doing eight knots since midnight. The skipper, our chief masthead hand, made a visit to the crosstrees and spotted the Gally Head light bearing N. by W., approximately distant twenty miles. This meant we were a bit far north and so course was altered to N.W. by W.

As day broke on Sunday morning, we found ourselves overtaking a yacht some distance ahead. Great was the discussion as to who she was—we hoped *Jolie Brise*. Our hopes were soon shattered, for as visibility improved, we discovered that she was *Lassie*. How *Lassie* was ahead of us we could not make out, as we were doing about two knots to her one, even after setting the working staysail instead of the balloon staysail which had carried away.

By breakfast time, the wind had lightened, the yankee jib was reset and *Lassie* was passed. Our navigator fixed our position from Cape Clear and Baltimore Bay and at 8.45 the Fastnet was sighted over the bowsprit. It was a cold, miserable day, and little could be seen of the mainland, as it was enveloped in fog. An hour-and-a-half later the wind died right away, and then, unfortunately for us, a light breeze sprang up from the N.W., giving us a dead beat to the Fastnet only a few miles distant. This beat took two precious hours, for we did not gybe round the rock until five minutes after midday, twenty minutes in front of *Lassie*. We learnt to our surprise that only *Nina*, *Mohawk* and *Jolie Brise* were ahead of us, making us still fourth in the running. (We learnt after the race that *Neptune* had passed during the previous night, but her identification signal had not been read and therefore not signalled to us by the light keeper.)

At 12.15, the spinnaker and yankee jib were set, log re-set, and the course set S.E. The weather by this time had much improved, and, with the sun shining and a following breeze, our spirits rose. The wind soon freshened considerably, and at 2.15 our second misfortune befell us. The spinnaker carried away at the clew, and even if repaired could only be used in light airs. The sail was got in with much difficulty and the first jib set on the end of the boom in its place.

By tea-time a strong N.N.W. wind was blowing, and the sea was decidedly rough. *Ilex*, always rather a difficult boat to steer in a following sea of any size, was giving the helmsman some heavy work,

and, in fact, by the end of a spell of an hour and twenty minutes he was more or less exhausted. The log showed eight knots since 2 p.m., and we were going still faster. Between 6 and 9 p.m. the log registered just over ten knots, and it was probably registering slow as it spent half its time out of the water. By nightfall, the wind had eased off a little and the seas were much longer, making it much more comfortable. *Lassie* was well astern but further to the north, and though we were still doing about nine knots, she appeared to be making up on us a little.

At 1.30 on Monday morning, we saw a starboard light about three-quarters of a mile on our port beam. It turned out to be *Lassie*, as she signalled to us with a flash lamp. We answered with a Verey light to which she replied with a green rocket. An hour later, we saw a second starboard light directly ahead of *Lassie*. We hoped we had caught up *Jolie Brise* We never discovered who this light was, as *Lassie* never saw any boats and, from what we learnt later, no other competitor could have been near at the time.

At 3.15 a.m. the Bishop Light, dead ahead, was picked up from the masthead, and Hunt decided to gybe. It was not a very pleasant task, as the night was very dark and there was still a strong wind and a big sea running, and, though the watch below was called up to assist, it was nearly an hour later before we were on our new course E. by S. After daybreak the wind backed, and we had to gybe again, an easy matter this time, as it was daylight and the sea had moderated somewhat.

At 8 a.m. the Cornish Coast was sighted over the port bow; by eleven, the Longships were abeam, and, after passing the Runnelstone half-an-hour later, a course of S.E.$\frac{1}{2}$E. was set to take us well clear of the Lizard on account of contrary tides. The weather had looked threatening the whole of the morning and just after midday we were struck by a heavy rain squall, which lasted nearly two hours. During the squall, we had to gybe and set a course E. by N. which carried us to Plymouth breakwater. Soon after 3 p.m., the rain stopped and the very unpleasant morning turned into a beautiful afternoon, which was spent in drying bedding and clothes, with the crew basking on deck. The wind eased off and the repaired spinnaker was set. This sail soon showed signs of going again at the clew, so it was strengthened by bunching it above the weak part and wrapping a stocking round the bunch. This held to the finishing-line.

At 8.30 p.m., the Eddystone was sighted on the starboard bow, and by 10 p.m. Plymouth breakwater was passed with *Lassie* well astern. We signalled our arrival in the Sound with two Verey lights, and after a tricky journey, trying to pick out the Channel buoy lights, we crossed the finishing-line at 10.28 p.m., *Lassie* finishing some twenty-odd minutes later. The run back from the

Fastnet had taken 34 hours 15 minutes, probably the fastest time so far recorded in the Fastnet Cup Race.

We thought we had finished fourth, as we could not have saved our time on *Nina*, *Jolie Brise* or *Mohawk*, and *Lassie* was giving us two hours. It was not until the next morning that we learnt that *Neptune* had been ahead of us the whole race. We finished fifth, therefore, in the race of twelve starters. Had we not had the bad luck to break our topmast, we must have done very much better. We lost valuable time when the topmast went, for thirty-six hours we had to carry only plain sail, and for the remainder of the race the yankee jib and spinnaker had to be "tucked" to fit to the shortened topmast and the jackyarder could not be carried.

Three members of the crew, Hunt, Crone, and Francis, are to be congratulated on the results of the race. Hunt made an excellent skipper. He sailed *Ilex* as well as anyone could wish for, and, working like a navvy himself, he kept his crew up to scratch throughout the race. It was very largely due to his determination that a jury topmast should be rigged somehow or other, that it was not given up as a hopeless task.

Our navigator, Crone, amazed the crew with the accuracy of his fixes and by the variety of his methods. By shooting the sun or stars, he could tell us the correction of the compass and chronometer, and fix our position to the nearest mile with the greatest ease.

But for Francis, *Ilex* must have been out of the running altogether. His skill at jointing the topmast was worthy of a master carpenter. His task, which took the whole afternoon and evening, was made more difficult by the fact that *Ilex* was beating into a nasty choppy sea, but, so well was it done, the topmast not only lasted throughout the race, but it carried canvas till *Ilex* returned to Chatham.

Carter was well up to his usual high standard in providing hot meals and drinks whenever required, and made us very comfortable below decks. Without a doubt, this makes all the difference to a crew in a long race, and, though the weather was much kinder this year than in any previous Ocean Race, it was largely due to Carter's efforts that the crew were as fresh at the end of the race as at the beginning.

The result of the race, due to a large extent to bad luck, was not as good as was hoped for, and voices are already being raised against *Ilex* taking part again. They say we cannot hope to compete against boats like *Nina*, built solely for the purpose of ocean racing. We may not be able to beat her class, but the R.E.Y.C. has a high reputation amongst ocean racers and it would be a great pity if *Ilex* does not compete in the future.

BATTLE HONOURS OF ROYAL ENGINEER UNITS.

(Continued from September, 1928, R.E. Journal).

JERICHO. 19TH TO 21ST FEBRUARY, 1918.

Unit.	Formation.		Remarks.
XX CORPS.			
436th (Welsh) Field Co.	53rd Div.	E.	
437th ,,	,,	N.E.	
439th (Cheshire) Field Co.	,,	D.	
519th (London) Field Co.	60th Div.	E.	
521st ,,	,,	,,	
522nd ,,	,,	,,	
1st Aust. Field Sqdrn.	Anzac Mtd. Div.	,,	
220th Army Troops Co.	XX Corps	N.E.	

SIGNALS.

JERICHO. 19TH TO 21ST FEBRUARY, 1918.

Unit.	Formation.		Remarks.
V Corps Signal Co.	XX Corps	E.	
53rd Div. Signal Co.	53rd Div.	,,	
60th ,,	60th Div.	,,	
1st Aust. Signal Sqdrn.	Anzac Mtd. Div.	,,	

JORDAN. 21ST TO 23RD MARCH, 1918. 11th APRIL, 1918.

Unit.	Formation.		Remarks.
XX CORPS.			
519th (London) Field Co.	60th Div.	E.	
521st ,,	,,	,,	
522nd ,,	,,	,,	
1st Aust. Field Sqdrn.	Anzac Mtd. Div.	,,	
No. 10 Field Troop	Imp. Camel Bde.	,,	
No. 13 Pontoon Park	G.H.Q.	D.	Attached 60th Div.
439th Field Co.	53rd Div.	,,	Attached 60th Div.

SIGNALS.

JORDAN. 21ST TO 23RD MARCH, 1918. 11TH APRIL, 1918.

Unit.	Formation.		Remarks.
60th Div. Signal Co.	60th Div.	E.	
1st Aust. Signal Sqdrn.	Anzac Mtd. Div.	,,	
Bde. Signal Sec.	Imp. Camel Bde.	,,	

TEL ASUR. 8TH TO 12TH MARCH, 1918.

Unit.	Formation.	Remarks.
XX CORPS.		
65th Field Co.	10th Div.	E.
66th ,,	,,	,,
85th ,,	,,	,,
436th (Welsh) Field Co.	53rd Div.	,,
437th ,,	,,	,,
439th (Cheshire) Field Co.	,,	,,
519th (London) Field Co.	60th Div.	,,
521st ,,	,,	N.E.
522nd ,,	,,	,,
No. 5 Field Co. R.M.R.E.	74th Div.	E.
No. 5 Field Co. R.A.R.E.	,,	,,
XXI CORPS.		
484th (E. Ang.) Field Co.	54th Div.	,,
486th ,,	,,	,,
495th (Kent) Field Co.	75th Div.	,,
496th ,,	,,	,,
No. 10 Co. 2nd Q.V.O. S. and M.	,,	,,
ARMY TROOPS.		
14th Army Troops Co.	XXI Corps	N.E.
220th ,,	XX Corps	,,

SIGNALS.

TEL ASUR. 8TH TO 12TH MARCH, 1918.

Unit.	Formation.	Remarks.
V Corps Signal Co.	XX Corps	D.
10th Div. Signal Co.	10th Div.	E.
53rd ,,	53rd ,,	,,
60th ,,	60th ,,	N.E.
74th ,,	74th ,,	E.
U Corps Signal Co.	XXI Corps	,,
54th Div. Signal Co.	54th Div.	,,
75th ,,	75th ,,	,,

MEGIDDO. I.—SHARON. 19TH TO 25TH SEPTEMBER, 1918.
II.—NABLUS. ,, ,, ,, ,,

Unit.	Formation.	Remarks.
	I.—SHARON.	
XXI CORPS.		
484th (E. Ang.) Field Co.	54th Div.	E.
486th ,,	,,	,,
495th (Kent) Field Co.	,,	,,
496th ,,	75th Div.	,,
No. 10 Co. 2nd Q.V.O. S. and M.	,,	,,
No. 16 ,,	,,	,,
20th Co. 3rd S. and M.	3rd Indian Div.	,,
21st ,,	,,	,,
65th Field Co.	,,	,,
3rd Co. 1st K.G.O. S. & M.	7th Indian Div.	,,
4th ,,	,,	,,
522nd (London) Field Co.	,,	,,
1st Co. 1st K.G.O. S. & M.	60th Div.	,,
519th (London) Field Co.	,,	,,
521st ,,	,,	,,

MEGIDDO. I.—SHARON. 19TH TO 25TH SEPTEMBER, 1918.
II.—NABLUS. " " " "

Unit.	Formation.	Remarks.
	I.—SHARON.	
DESERT MOUNTED CORPS.		
4th Field Sqdrn. (late 6th)	4th Cav. Div.	"
5th " (late 7th)	5th "	"
2nd Aust. Field Sqdrn.	Aust. Mtd. Div.	"
ARMY TROOPS.		
14th Army Troops Co.	XXI Corps	"
13th Pontoon Park	"	"
	II.—NABLUS.	
XX CORPS.		
18th Co. 3rd S. and M.	10th Div.	E.
66th Field Co.	"	"
85th "	"	"
436th (Welsh) Field Co.	53rd Div.	"
437th "	"	"
72nd Co. 3rd S. and M.	"	"
CHAYTOR'S FORCE.		
1st Aust. Field Sqdrn.	Anzac Mtd. Div.	"
ARMY TROOPS.		
220th Army Troops Co.	XX Corps	"

PROFESSIONAL NOTES.

MILITARY ENGINEERING, VOL. III, 1928.

A NEW edition of *M.E. Vol. III* has recently been published, and the following notes indicating the main differences between the new and old editions may be of interest.

Various amendments and additions to the new edition have already become necessary, and are being taken up; they have not been specifically dealt with in these notes.

GENERAL ARRANGEMENT.

Instructions on Pontooning are now contained in a separate pamphlet, " Pontoon Bridging, 1928," and the chapter on pontooning has therefore been omitted.

The majority of the tables have been collected together at the end of the subject matter and just before the plates. This should facilitate reference to them.

The chapters on Inglis, Hopkins, and other stock span bridges, have been omitted, as these types are no longer retained as R.E. Vocab.

Stores. Plans and details of construction are being preserved in case any of them should be required on some future occasion.

A chapter on the Box Girder Bridge is included.

THE TEXT.

Chapter I has been re-written.

Sec. 2 gives the classification of military equipment bridges, and should be read in conjunction with Sec. 14.

It should be noted that the classification in Section 2 refers to bridges carried by formations as part of their equipment. The classification adopted for other types of bridges, as given in Section 14, was found necessary, as the definition of heavy bridge as applied to equipment bridges was unduly wide.

The question of bringing these two classifications more closely into agreement will require further consideration as soon as the loads to be carried become more stabilized.

The statement in Section 2, para. (iii), that the heavy equipment (pontoon) bridge will carry 16-ton axle loads, assumes that a very small proportion of the weight on the adjoining axle will be taken by the pier carrying the 16-ton axle load at any moment.

Chapter II has been re-written and condensed. It deals more fully with the subject of reconnaissance, and omits most of the detailed instructions on the framing of reports. This is in accordance with the principle that an engineering report is only a particular form of appreciation, and should, therefore, follow the same general lines as any other appreciation, as indicated in *T. and M. Regulations.* Details must naturally vary considerably with the circumstances, and no hard and fast rule can be laid down as to what should or should not be included. Further details of work tables, transport tables, etc., are given in Chap. IX, Sec. 57, Organization of Work.

Sec. 11 contains, more appropriately, the details of fords and the crossings which used to be in Chapter I of the old volume.

Chapter III has been considerably expanded.

Sec. 12 is new, and deals with the elementary theory of bridge design.

Sec. 13, bridge loads, lays down clearly what allowances should be made for impact. These differ considerably from the old impact factors, and it should be noted that no impact allowance is necessary for track vehicles or for infantry, when the figures for " crowded at a check " are used.

Sec. 14, table of loads, is a further elaboration of Sec. 2. It should be noted that all heavy loads are only allowed to cross a bridge singly. A load may, however, consist of a train of artillery vehicles, and for any span of more than 30 feet or so, the artillery train usually causes

worse cases of loading than a tank. The actual loads due to animals and vehicles are given in Tables A to E.

Sec. 15 has been added, and deals with the effect of track vehicles on bridges.

Sec. 16, ruling dimensions. A 9-ft. roadway is now given as the normal width for all ordinary M.T. vehicles, whereas on p. 37 it is stated that the roadway for M.T. should be 10 ft. wide. By having a 9-ft. roadway it may be possible to economize in the number of road-bearers and size of decking. Apart from this, there is no object in cutting down the roadway to less than 10 feet. There are also a few other minor alterations, such as 1-ft. 10-in. and 5-ft. minima for infantry in single file and file respectively.

Sec. 17, working stresses, is much the same, but the table giving the working stresses in timber also includes the weight.

Sec. 18 now contains a sub-paragraph on shear, though still perhaps in too little detail, as it does not touch on the relation between the average and maximum intensities. Sec. 46 and 47 in Chap. VII work out in full two typical examples of the normal calculations necessary to make clear the practical application of the theory of shear. Sec. 47, however, contains one or two errors.

Sec. 19 has been added, and deals with the design of road-bearers and decking. This section, together with Table H, to which it refers, should prove useful.

Sec. 20 is also new, and deals with the carrying capacity of existing bridges, which has not been dealt with previously.

Chapter IV contains everything in the old Chaps. IV and V that is not now included in "Pontoon Bridging, 1928." It contains sections on buoyancy, rafts, flying bridges, anchors, tidal ramps, piers and pierheads. All these sections have been largely re-written and increased in scope.

The table in Sec. 21, giving the details of boats used in the Royal Navy, contains many alterations.

Sec. 24, Flying Bridges, includes methods of getting a line across a river.

Chapter V corresponds to the old Chap. VI, and contains only a few minor alterations.

Sec. 29 includes a new method of reeving tackles which allows the pull to come off the centre sheave without any crossing of returns. This method tends to prevent twisting and also reduces the friction, but, of course, is of more value for heavy and light gyn tackles than for tackles that do not contain a treble block. It does not, however, seem to decrease the tendency to twist in long runner tackles, and certainly does not do away with the necessity for anti-twisters.

At the end of the chapter there is a useful summary of formulæ used in designing derricks and tackles.

Chapter VI corresponds to the old Chap. VII, and contains only a few minor alterations. The section on aerial ropeways has, however, been omitted.

Sec. 31 contains an improved method of making up a cable.

The examples in Secs. 33 and 36 have been corrected.

Chapter VII. The old Chap. VIII, has been almost completely re-written.

Sec. 39 contains only minor alterations, including the advantages and disadvantages of the use of "dogs."

Secs. 40 to 43 deal more fully with the design and construction of trestles.

Sec. 44 on timber cribs has been added as a separate section.

Secs. 46 and 47 have been added, and contain fully worked out examples of the use of single trestles and a trestle pier. Sec. 47 contains one or two errors. The amendment of these is being taken up.

Sec. 48 on timber girder bridges has been enlarged, and deals more fully with the joints and calculations.

Chapter VIII. The old Chap. IX, has been completely re-written.

Sec. 50 deals more fully with the design of footings, and also contains a sub-paragraph on the effect of scour.

Sec. 52 includes calculations for bearing power of piles, and only gives Wellington's formula, omitting the modification of Trautwine's formula that used to be included. It should be noted that the formula now given differs from that in the old volume, as the factor of safety now allowed is 4 instead of 6. A short table showing safe loads is given at the end of this section.

Sec. 53 includes details of a portable pile-driver suitable for use in the field.

Sec. 56 has been added and gives details of an example of a rapidly constructed pile bridge.

Chapter IX is much the same as the old Chap. X, but some of the paragraphs have been condensed. The table giving the dimensions of transport includes the details of six-wheelers.

Chapter X gives full details of the box-girder bridge. It must be realized, however, that there are sure to be many alterations as improvements are suggested. The design of the actual roadway will probably be altered so as to allow a greater clearance between the curb and the handrails. The method of launching is also undergoing change. The two-derrick method is obsolescent. To avoid the use of the second derrick or jacks to lower the girder off the rollers, a spar can be inserted under the end of the girder, and the girder levered into position.

The following are some of the minor points which require consideration :—

1. The removal of the projecting corner of the plate riveted to the hornbeam at the lower end of the sloping portion.
2. The provision of rollers of sufficient width to take the full width of the hornbeam section.
3. The revision of the number and size of small stores, such as strops, shackles, etc.

It must be remembered that the stores provided are for normal launching conditions, and that calculations must be made for any conditions that are abnormal, both as regards strength and length of ropes required. For example, when building a bridge of two spans, an 80-ft. and a 30-ft., if the derrick has to be placed at the far side of the 30-ft. span in order to haul the box-girder across the 80-ft. span, the stress in the preventer tackle is increased to about 10 tons. Other similar instances may easily occur. Perhaps, also, it is not brought out sufficiently clearly that a considerable quantity of stores has to be taken across the gap before the box-girder itself can be launched. If the bridge is to be built rapidly, good organization and attention to such minor details are essential.

TABLES.

General remarks. As already stated, most of these tables are grouped together at the end of the text, but it might be well to summarize here the few small tables which do appear in the text itself, as these are not indexed anywhere.

Many very useful tables have been added, most of them in the form of ready reckoners, designed to save time and energy that would

otherwise have to be spent on lengthy calculations, as will be seen from the following detailed notes.

Tables A to E. Bridge Loads.

Six-wheelers have been included, but unfortunately tanks, including some of the obsolete type, are still shown under their old nomenclature. It should be noted that the axle weights of a 3-ton lorry are slightly larger than those shown in the old Vol. III. Wheel track dimensions, unless otherwise stated, are centre to centre.

Table F. Equivalent uniformly distributed dead loads.

Is an up-to-date edition of the old Table G.

Table G. R.S.J.s.

Contains the properties of the British new standard joists.

Table H. Size of decking and roadbearers.

This has also been added. It is valuable, as considered in conjunction with Sec. 19, it is the only quick method of arriving at the distribution of the load to the roadbearers and of assessing a suitable size of decking.

Table I. Bending Moments and Shear.

This does away with the need for many calculations that would otherwise be necessary. For any class of loading, this table shows at once the maximum bending moments set up, the maximum end reaction, and therefore the maximum shear. Spans of from 10 to 150 ft., at 5 ft. intervals, are given for medium loads, and all three classes of heavy loads. It should be noted that all necessary allowance has been made for live loads, but that consideration must be given to uneven distribution to the several roadbearers, and allowance made for the weight of the superstructure.

Table K. Arches.

Gives the necessary crown thickness of arches in two cases, *i.e.*, 10-ton and 16-ton axle loads. This is a very valuable addition.

Tables L and M.

Are much the same as the old Tables O and P on the strength of cordage and steel wire ropes.

Table N. Iron Wire.

Has been added and gives all details, including size, weight, and strength.

Table O. Strength of ropes and tackles.

Is another valuable ready reckoner and saves the use of the formula $P = \frac{W}{G}(1+fn)$ in all cases (with $f = 1/10$), and also gives the pull in slings of tackles.

Table P. Timber girder bridges.

Is an improvement and enlargement on the old Table S.

Table Q. Work Table.

Differs considerably from the old Table T, and is worth study.

Tables R, S, T.

Are practically the same as the old Tables U, V, W, specimens of transport and stores tables and of a progress record.

Table U. Man-hours for various jobs.

Is an up-to-date edition of the old Table X.

Tables V, W, X, Y, Z. The box girder.

These are all new. One error in Table XX should be noted. The two treble blocks should be used in the preventer tackle and one treble and one double block in the hauling tackle. This error also occurs in the corresponding Plate 73. As mentioned above, it is quite probable that several minor alterations will be made in the tables of stores.

The Index has been enlarged, and reference can now be far more readily made to the text. The text itself refers to all tables and plates.

PLATES.

The total number of plates has been reduced by nearly half. Those that have been omitted deal chiefly with the old stock spans, pontoon equipment, aerial ropeways, etc.

The following plates need, perhaps, special mention :—

Plate 2. *Tanks.*

Is unfortunately not up-to-date, but amendment has been taken up.

Plate 3. *Graphical determination of* M_r.

Has been extracted from the old Vol. IIIa, and is most useful. It is the only place in the book where any data as to the strength of rails can be found.

Plates 10 *and* 11 are new, and show methods of getting a line across a river.

Plate 32. *Making wire ropes.* Has been added.

Plate 47 is an example of the amount of detail required in a working drawing.

Plates 50 *and* 51. *Timber trusses.*

Are a great improvement on the old plates, and show the method of construction far more clearly.

BOOKS.

OFFICIAL HISTORY OF THE WAR. MILITARY OPERATIONS, FRANCE AND BELGIUM, 1915.

BATTLES OF AUBERS RIDGE, FESTUBERT, AND LOOS.

Compiled by BRIGADIER-GENERAL SIR JAMES E. EDMONDS, C.B., C.M.G., R.E. (retired), *p.s.c.* Maps (in separate case) and Sketches compiled by MAJOR A. F. BECKE, R.A. (retired), HON.M.A. (Oxon). (MacMillan & Co., Ltd., London, 1928. Price 12s. 6d., Maps 5s. 6d.)

In his preface Sir James Edmonds reminds his readers that the historian is forced to depict a battle with an orderliness which was not apparent during the actual events, and that it is quite impossible to give an adequate representation of the organized confusion of modern warfare. If the power to obtain orderliness out of chaos is a fault, the official historian is to be congratulated on possessing it. For, whether the reader scans the volume in an armchair over the fire, or whether he sets out to make a detailed study of the operations with Major Becke's excellent maps spread before him, he cannot but admit that the narrative of each battle is wonderfully easy to follow. The account of the Battle of Loos especially is a masterpiece of clear expression, orderly arrangement and valuable criticism.

The mistakes that were made in these first offensives of the B.E.F. are clearly indicated, and, where necessary, commented on. The lessons they teach cannot fail to impress themselves on the mind of the reader, whether he be an experienced soldier or a youngster with his baptism of fire still before him.

General Edmonds was fortunate in being able to submit the typescript of this volume to the late Field-Marshal Earl Haig. The Commander of the First Army of 1915 not only made marginal notes on the draft, but also wrote some general remarks on the various chapters. The accuracy of the narrative and the correctness of General Edmonds' appreciation of the condition of affairs during the period covered by the volume are thus hall-marked by the highest authority, after a sufficient lapse of time to allow of events being seen in true perspective.

It will be remembered that the general plan of operations of the Allies for 1915 was based on the knowledge that, after carrying on operations against the Russians throughout the winter, the Central Powers were preparing a great offensive on the Eastern Front, and to strengthen it had withdrawn a large number of troops from the West. The movement of these reserves—amounting to 100,000 men, with a full complement of artillery—offered the Allies a great opportunity not only to assist Russia,

but also to drive the invader out of France and Belgium. Moreover, a speedy offensive would be in keeping with sound strategy.

At this crisis there was no divergence of opinion between the Allied Commanders-in-Chief, or the Allied Governments, as to the necessity of assuming the offensive as early as possible in the spring. As the preparations progressed it became evident that the Germans were working at their defences, but Sir John French probably had little conception of what was really going on behind the German wire, and, if he had suspicions, he had no gun ammunition to spare for "strafing" the German working parties at night.

The German Higher Command were fully aware of the risks they were taking on the Western Front by the withdrawal of reserves. The Battle of Neuve Chapelle had exposed the weakness of their front line defences, and, immediately this battle ended, they set themselves systematically to strengthen the line. An immense amount of work was accomplished, strengthening breastworks, parapets, and wire, and constructing dug-outs, hidden machine-gun emplacements, and support and communication trenches. The fact of the completion of so much work in so short a time—eight weeks—is made the subject of special mention in the histories of some of the German regiments concerned. The result of their efforts was that, when the Allies were ready to attack at Vimy and the Aubers Ridge in May, they had a very different proposition to face to that which had confronted the British at Neuve Chapelle in March, when the German front was all but pierced.

The Allied offensive was launched on 9th May. The French Tenth Army, under General d'Urbal, after a bombardment lasting six days, achieved considerable initial success in their attack on Vimy Ridge. But the British, who had only enough ammunition for a short preliminary bombardment of 40 minutes in the early morning of the 9th May, failed to break the line at Aubers Ridge, fifteen miles north of the French. Although the British attack came more or less as a surprise, it was not altogether unexpected by the Germans. By the evening of the 9th of May, the German Higher Command were satisfied that the local troops could hold the British, and were able actually to set in motion what reserves they had—two divisions—and divert them to assist in the defence of the Vimy Ridge position.

Little is said about the British attack in the German histories. They recognize that it was undertaken to assist the main, the French attack.

It is interesting to note that, after the move of the two German divisions in reserve to Vimy, there were no reserves whatever behind the German line between Armentières and the La Bassée Canal.

The Official Historian's comments on the Battle of Aubers Ridge are as follows:—

"The results of the offensive of the 9th May were a serious disappoint-
"ment. . . . Their (the Germans') industry in improving their defences
"had been fully repaid: it was one more example of the truth of the
"German Army proverb that 'sweat saves blood.' A British infantry
"brigadier summed up the matter, at the close of the battle, in the words,
"'the sapper has beaten the gunner.' *The Times* newspaper, in a
"leading article on 14th May, said, 'British soldiers died in vain on the

" ' Aubers Ridge, on Sunday, because more shells were needed.' Neither " phrase entirely fitted the situation. The failure at Aubers Ridge was " in fact due to three causes: first, the strength of the German defences " and the clever concealment of machine-guns in them; secondly the " lack on the British side of sufficient shells of large calibre to deal with " such defences; and thirdly, the inferior quality of much of the ammuni- " tion supplied and the difficulties of ranging, so that the British gunners " were unable to hit their targets and the German counter-batteries and " machine-guns were not silenced." Defective fuzes: shells that did not burst: worn guns causing shells to fall short. As a general result, the brief 40-minutes bombardment, though it raised a curtain of dust and smoke immediately above the enemy's front line, did no appreciable damage, and merely gave the enemy warning to stand-to to meet an assault which he had been expecting for twenty-four hours before it was delivered.

On the 15th May, General Foch decided to renew his efforts against the Vimy position; and, although the desperate situation of the Second Army at Ypres, where the Battle of Frezenberg Ridge (8th–18th May) was in progress, caused Sir John French the gravest anxiety, the British C.-in-C. had no thought of abandoning his offensive operations in support of the French Tenth Army.

Events in other theatres—the failure at Krithia (6th–8th May), and the successes of the Austro-Germans in Galicia—had far-reaching effects, and Sir John French was kept in doubt as to what reinforcements, if any, he would receive from England before he resumed the offensive. Preparations were, however, pushed on for a second effort north of Festubert. Sir Douglas Haig decided to depart definitely from the procedure of previous British attacks. He now proposed to follow the French method of a long methodical bombardment of the enemy defences before the infantry were sent forward. This bombardment commenced on 13th May, and was continued on the 14th May. On the 15th May, there were during the day two short intensive bombardments in the nature of feints in the hope of inducing the enemy to man his parapets, but the main assault was not delivered till 11.30 p.m., and then without any preliminary bombardment, by the 6th, 5th, and Garhwal Brigades. The right of the 2nd Division attack was entirely successful in capturing its limited objective, the German front line defences, but the centre and left attacks failed to reach the enemy's front trench—the element of surprise having being unwittingly eliminated by feints further to the left, which had put the enemy on the alert.

At 3.15 a.m. on 16th May, the 7th Division attacked with two brigades after an intensified bombardment lasting half an hour, and was partially successful. But a gap was left between the breaches made by the two divisions. The Germans endeavoured to re-establish their front line, but failed to do so, and after working desperately to improvise a new front line in rear, they withdrew to it on the evening of 17th May.

From this new position they were never ousted, despite repeated attempts by brigades, including the 4th Guards Brigade, of the 7th Meerut, 2nd Canadian and 47th Divisions. The fighting continued until 25th May, when the battle was allowed to die down.

The remarks of the Official Historian on the Battle of Festubert must be quoted :—

"The results of the attack at Festubert had been tantalizing. Under-
"taken solely for the purpose of assisting the French, considerable
"success had been achieved even with the small number of guns and
"limited amount of ammunition available. . . . The Germans had
"been compelled to withdraw from a strong position on which they had
"expended many months of labour to a hastily improvised new line.
"If this new line could have been attacked at once, there was every
"reason to expect that it could have been easily carried. How perilous
"the enemy thought the situation on the 16th and 17th May owing to
"the dearth of reserves will be seen from his narrative in the Note (pp.
"80–81–82) at the end of this chapter. The British leaders felt that
"they were on right lines, and that with more gun support they might
"have reached Aubers Ridge . . . success was judged to be a matter
"of persistence. Another similar effort might break through the
"German line and at any rate compel the enemy to bring up greater
"reinforcements, which otherwise might be used against the French, who
"had made good progress. The fighting standard of the Army . . .
"was now improving again. . . . On the material side, however, heavy
"guns and high explosive shell were . . . not yet forthcoming. Yet
"every day's delay in providing them meant another twenty-four hours
"presented to the enemy in which to perfect his defensive arrangements
"and increase the difficulties of the next attack. For the moment, the
"Germans seemed to be superior in both attack and defence . . . but
"it was thanks only to their overwhelming superiority in artillery,
"trench mortars, and machine-guns, and the greater effectiveness of
"their stick grenades. At the close of the battle, the British Com-
"manders not unnaturally felt that, given anything like the same
"equipment for close fighting that the enemy battalions possessed, their
"infantry, even with its hastily trained subordinate leaders, could be
"relied on in the attack to do better than the foe."

It can be deduced from the above that the Official Historian is of opinion that the British C.-in-C. was justified in fighting at Festubert until his divisions were exhausted, even after the failure at the Aubers Ridge, on the ground that the opportunity for an offensive to expel the invaders of France and Belgium, afforded by the absence of so many German divisions in Russia, might never recur, if for no other reason.

Field-Marshal Earl Haig's comments on the accounts of the two battles are as follows. Of the Aubers Ridge chapters he wrote :—"I
"think you have brought out very well the terrible conditions under
"which the First Army had to carry out the C.-in-C.'s orders to support
"the French at all costs. The ammunition was very bad: fuzes
"inefficient; and a great shortage of all kinds of shell. So that the
"means for a real bombardment were lacking." His remarks on the Festubert chapters were :—"A very true account of the situation of the
"B.E.F. in the summer of 1915. You show very well what tremendous
"efforts and what sacrifices all ranks made to support fully and loyally
"our French Ally. And I hope that the British people will realize

" what ' unpreparedness for war ' cost the Empire in flesh and blood in " the years with which you are dealing."

The French offensive launched simultaneously with the attack at Festubert was also unsuccessful. In a note on the operations of the Tenth French Army between 15th May and 18th June against the Labyrinthe, Neuville St. Vaast and Souchez, General Edmonds quotes the French special reports for the reasons for the lack of success :— " The insufficient number of heavy guns and the domination of the " German heavy artillery : the numerous burstings of guns, and the " defective gun ammunition, owing to hasty manufacture : the want of " experience of officers and N.C.O.s owing to previous heavy losses." He also quotes the French Official History :—" Our battalions often only " pushed on straight ahead, bravely, but without thinking of manœuv- " ring, and they often lost by enemy counter-attack ground that they " had brilliantly won."

The German losses in this period—50,000—were less than half the French—104,000.

The only fighting in the interval between the Battles of Festubert and Loos took place on June 15th-16th at Givenchy, south of Festubert ; on June 16th at Bellewarde Ridge : and on July 30th at Hooge. The British attack at Givenchy failed owing to lack of covering fire in the initial stage, and the only ground won was lost again owing to the persistency and efficiency of the German bombers.

The attempt to improve the 2nd Army front facing Bellewarde Ridge (north of Ypres) was entrusted to the 3rd Division. " Reliance was placed," writes Gen. Edmonds, " on surprise as to time rather than " deception as to the place of attack. Unfortunately the German " observation posts on Bellewarde Ridge were too far away to be taken " in the first rush ; they commanded all the ground over which the " advance was made, and so long as the Germans held them they directed " converging fire over it."

Though the re-entrant in the British front had been slightly reduced and the British line carried forward to just north of the Menin Road, the enemy retained possession of the Bellewarde Ridge and the observation posts on it. The losses—140 officers and 3,391 other ranks—were almost entirely due to the enemy's artillery fire, with which the British heavies, handicapped by inadequate guns and limited ammunition, were unable to cope. The Germans lost 157 prisoners, but only suffered about 300 casualties.

The enemy attack on the trenches of the 8th Rifle Brigade (14th Division) at Hooge at 3.15 a.m. on 30th July was a complete surprise, and would probably have led to an entry even at the strongest point of the line. It was the first attack on the British with *Flammenwerfer* (liquid fire throwers), and was supported by an overwhelming artillery and trench mortar bombardment.

In these early days, it was an unwritten law that if trenches were lost they must be immediately regained. The counter-attack, a frontal one across open ground, was launched at 2.45 p.m., and resulted in three battalions of the 43rd Brigade (14th Division) being practically wiped out. The only possible chance of success was to have deferred it till the

evening or night. A new line was consolidated through the northern edge of Sanctuary Wood and along the north-east edge of Zouave Wood. This was attacked by the Germans at 2 a.m. on the 31st July, again assisted by liquid fire, but they failed. The efforts of the 14th Division to gain ground on the 31st were brought to nought by the enemy's heavy artillery fire. "It was then clear," writes General Edmonds, "that "nothing but a regular attack, thoroughly prepared—as distinguished "from a hasty counter-attack—would dislodge the enemy. . . . The "attack (carried out by General Congreve's 6th Division) was a model of "its kind, took the enemy by surprise, and was entirely successful; "it marks further progress in the methods of minor operations." It is fully described on pp. 106–109, and should be studied.

THE BATTLE OF LOOS.

Despite the ill-success attending the Allied offensives in May, General Joffre and Sir John French were in absolute accord as to the necessity of continuing the offensive in accordance with the original French plan for the 1915 campaign. This was to advance on two convergent lines, by attacking in Champagne northwards, and in Artois eastwards, so as to pinch the three German armies holding the great German salient about Noyon and get astride their lines of supply and retreat, and so drive the invaders out of France and Belgium. It was originally intended to make a third advance from the Verdun-Nancy sector, but this it was now decided to defer.

But the effect in England of the great losses incurred by the B.E.F. in March and May, coupled with the want of success in Gallipoli, and the failure of the Italian offensive, had brought another factor into the problem. Mr. Lloyd George had now become Minister of Munitions, and in that capacity he represented the British Government at a series of conferences held at Boulogne on the 19th and 20th June, which was attended by the French Minister of Munitions and representatives of the British and French Headquarters. The result of these conferences was a decision by the British Military Authorities that, in view of (1) the shortage of guns; (2) the shortage of gun ammunition; and (3) the fact that the spring offensives had failed—largely because of the lack of both infantry and artillery—owing to the attacks being delivered on too narrow a frontage, a British offensive on the Western Front, if it was to have reasonable chances of success, would have to be delivered on a continuous front of at least 25 miles, by a force of not less than 36 Divisions, supported by 1,150 heavy guns and howitzers and the normal complement of field artillery. It was further maintained by the Minister of Munitions that as this quantity of guns and the necessary ammunition could not be forthcoming before the spring of 1916, until then it was preferable, whatever the general situation, to remain on the active defensive in the western theatre of war. This expression of opinion in no way affected the determination of General Joffre to go on with the French plan for an offensive at as early a date as possible; and there is no doubt he had public opinion in France behind him.

Thus a vital difference of opinion now arose between French and

British Headquarters in France. General Edmonds describes the progress of negotiations, of which the first outcome was that it was arranged that the offensive must be postponed to the end of August to allow time for the relief of the French XIth and XIVth Corps by the newly-formed British Third Army—south of the French Tenth Army—and further necessary preparations.

During these discussions it became evident that, owing to the continued success of the renewed German offensive in the East, it was not unlikely that the Russians would drop out of the war before the end of the year unless the Allies could compel the Germans to relax their pressure on the Eastern Front. So it came about that, against the judgment of Sir John French, the participation of the B.E.F. in the proposed French offensive was eventually ordered by Lord Kitchener.

The next difficulty was to decide on which sector the British should attack. The French insisted that the British attack must be close to the left of the French Tenth Army, that is, south of the La Bassée Canal. Sir John French favoured an attack astride the Canal, together with an attack on the Messines Ridge, to relieve the situation in the Ypres Salient. Sir Douglas Haig wished to attack only at the Aubers Ridge. Eventually Sir John had to yield to French pressure, and it was decided to attack at Loos in conjunction with the French Tenth Army on the British right. Subsidiary attacks were to be made simultaneously by the III Corps at Bois Grenier, and by the V Corps at Bellewarde Ridge. Precious time had already been lost.

Further delay was caused by the backward state of the French preparations in Champagne, which was now to be regarded as the most important attack. Eventually, on Sept. 4th, it was decided to start the offensive on Sept. 25th. As events have proved, the respite of two months thus given to the enemy was fatal to the Allies.

" In war," writes General Edmonds, " delay is generally more advant-
" ageous to the defence than to the attack ; so now, while the French
" and British were accumulating their heavy guns and ammunition, the
" Germans were even more diligent in strengthening their defences.
" They realized no less clearly than the Allies that, with an increased
" supply of heavy artillery and a greater volume of ammunition, French
" and British attacks like those in May and June, 1915, might well break
" their present system of defence on the Western Front. In all haste,
" therefore, they set about finding appropriate counter-measures.
" Ignoring the precept of their peace-time manuals—one line of defence
" only and all efforts devoted to it—the plan adopted was to build a
" second defensive system from two to four miles in rear of the first,
" and of similar, if not greater, strength."

By the end of July, the second position had assumed a definite form on the whole length of the Western Front, and, where the line itself was not complete, strong points and redoubts containing emplacements for machine-guns had been prepared every few thousand yards.

The existence of this new system of defence, which was clearly visible on air photographs, altered the aspect of the attack, and clinched matters as regards the object and objectives of the British offensive.

The reader must go to the Official History for the narrative of the

battle, for it can hardly be further condensed. The orders for the assault were complicated by the use of gas, now available for the B.E.F. for the first time. Every eventuality seems to have been provided for should the wind prove unfavourable. In the event, it was only partially favourable. Had the wind been wholly favourable there is little doubt that the initial attack would have been successful on the whole front. Whether a break-through would have been achieved it is impossible to say, for mistakes were made which might have prevented the reserves being up in time to carry the operation to its final objective. To understand these mistakes we cannot do better than quote from General Edmonds' " Retrospect " :—

" It would be idle to pretend that the outcome of the Battle of Loos " was not a bitter disappointment ; the more so as such decisive results " had been expected from the attack of the French Tenth Army, to " facilitate which the battle was undertaken and fought. . . . The plan " devised by General Haig . . . was a sound one. It was known that " the Germans had no large reserves at hand, and it was fair to assume " that the great French effort in Champagne, and the lesser one on the " immediate right near Souchez, would draw off a considerable portion, " if not all, of the small numbers available. The First Army and its " Corps had not kept back reserves, but had used all their forces in the " front line ; for everyone understood that the XI Corps constituted the " reserve that would push through, or at least would be sent up by " divisions as soon as the reserve brigades of the assaulting divisions had " been put in. The head of the XI Corps might have been up by 6.30 " a.m. (the hour of the original assault), well fed, its route reconnoitred " and cleared. At 10.30 a.m. the two leading divisions of the Corps " were still in their bivouacs between Noeux les Mines and Beuvry. By " that time it was already too late ; the critical moment had passed, the " momentum had been lost, and though it was still possible to gain a " minor success, the big opportunity had gone for ever."

" The attempt of Sir John French to influence the battle by holding " back divisions in reserve was ill-considered and tactically out of date ; " he had not even had routes specially marked and kept clear, so that " the General Reserve could be rushed up at the utmost speed. War- " experienced divisions would no doubt have managed to get up to the " front more quickly than did the two newly-arrived ones chosen by the " C.-in-C., and would have reached the field comparatively fresh and well " fed ; but to hold back a reserve composed of such raw troops was " fatal."

" Time was the issue of the matter. . . . Everything depended upon " whether the British general reserve or the German units to stem the " flood arrived first. And the former might have been ready and " prepared to move at the shortest notice to the place where the German " line was most likely to break, while the enemy was bound to wait and " see where his scanty reserves were most required. On the one side " there was a clear-cut issue ; on the other, doubt and the doubtful " problem which usually confronts the defender."

" The 21st and 24th Divisions, which, together with the Guards " Division, formed the General Reserve, were imperfectly trained, had

" never been in line, far less in battle, and did not know the ground, but " given the opportunity which had been offered with the German " infantry on the run and guns limbering up and going, they were " probably adequate to take a certain advantage of it. Indeed, the " C.-in-C. selected these divisions because he shared the opinions expressed " at the time by some officers who had been in the Ypres Salient, that " Divisions long engaged in trench warfare had got out of the way of " attacking and manœuvring in the open, and that therefore it was " better to employ untried ones. The Guards Division he regarded as " a final reserve. He meant to engage the others, but his lack of faith " in divisions wholly made up of new troops continued to influence him, " and in the end he procrastinated while the First Army, its corps, and " its divisions had relied on prompt action." For although it was certain that Sir John French had been committed to an offensive against his better judgment, all assumed that, having definite orders to attack with vigour, he meant to do his utmost. Whether three divisions, the Guards leading, would have been enough to deal with the German reserves, including the Guard Corps then in hand, can never be known.

" If the Guard Corps (two divisions) had been put in against the " British front, it would not, as it was, have been diverted to the Vimy " front, and the French might have broken through and restored the " battle. Once battle was engaged, the risk of meeting enemy reserves " had to be taken ; the original assaulting divisions could at any rate " have consolidated their gains, as the 24th Division did near Loos " Crassier, the 15th Division on Hill 70, and the Loos-Hulluck road, and " the 7th Division on the line of Gun Trench, whether the XI Corps came " or not."

" The French, with their greater forces, many more guns, and vast " ammunition supply, as compared with the British, equally failed to " break through, but for other reasons. There was no surprise. In " Champagne, the enemy did not attempt to hold them in his first " position, but met them, with every advantage, in his second ; in " Artois, the front line on Vimy Ridge was of great strength, having been " attacked before, and it was entered only at a few places. The French " official explanation of the failure is first, that the infantry were not " fully prepared owing to certain divisions arriving on the ground only " shortly before the attack, and others having their tasks and zones of " action modified ; secondly, owing to bad weather the artillery prepara- " tion so lacked precision and certainty that a postponement of the " attack was advisable, but the state of ammunition supply did not per- " mit of this : thirdly, the enemy wire was not efficiently destroyed ; " fourthly, and this is of particular interest, some of the Army Reserves " were too close up to the front. As there was no break-through, there " was no opportunity to employ them, and being in the battle zone, they " suffered heavy losses for no purpose ; further, being so near the front, " the area in which they could be used was limited, and they were not " available to be directed where they were most particularly required. " Sir John French did not make this mistake. But he not only placed " his reserve divisions too far back, but the steps which might have been

" taken to keep the way clear for their advance when it was ordered were " not taken."

General Edmonds is only just in correcting the hasty and wrong impression which prevailed in some quarters after the battle as to the conduct of the new divisions. " All knew "—he writes—" that as a whole the new divisions had done magnificently, and would do better next time in spite of the heavy gaps in their ranks." This judgment the writer can warmly endorse, for the 63rd Brigade, then in the 21st Division served under his command for over two years, and all its battalions, in particular the 8th Somerset Light Infantry, whose gallantry at Loos is mentioned, and which bears more battle honours than any battalion of that famous regiment, never failed to make good in attack, while in defence they more than justified the reputation of the English county regiments for the tenacity with which under the worst conditions they held on to the ground they had won.

The 1915 volume concludes with a note on the inception of the Salonika Expedition and the evacuation of the Gallipoli Peninsula, and a reference to the transference of the Indian Corps to Mesopotamia, and the retirement on December 17th of Field-Marshal Lord French.

The Appendixes contain the Orders of Battle and give the most important Operation Orders in full. There is a useful Index of Place Names at the beginning of the volume, and a good General Index.

Accompanying the volume is a sheet of Addenda and Corrigenda to Vol. II, 1914, additional to those issued with Vol. III, and some pages of Addenda and Corrigenda to Vol. III itself; with the usual request that officers who notice errors and omissions in the volume under review should communicate with the compiler.

H.B.-W.

SHIKAR.

By LIEUT.-COLONEL C. H. STOCKLEY, D.S.O., O.B.E., M.C., F.R.G.S., F.Z.S. (Constable, 12s. net.)

It was only in the last number of the *R.E. Journal* that a book, *Big Game Shooting in the Indian Empire* was reviewed, and the author of that excellent and scientific work has now published this series of tales of shikar which are fully up to his high reputation as shikari, naturalist, and writer.

The book will appeal rather to those who have tasted the delights of shikar in India than to those for whom those delights are in store, and more especially to those whose greater interests lay in the hills rather than in the plains; but to none can it be dull. While, naturally, all description of shikar must stress the successes rather than the failures, the latter are not forgotten.

The author has captured the atmosphere of Indian shooting in a delightful way, which to each one will bring back his own recollections, and for those who have not the gift of the pen to put them down in

writing for themselves this work will help to keep them green. A diary kept day-by-day is a most important part of one's outfit, and no outing should be thought too trivial for mention in it. This book is evidently the result of keeping such a diary. Experiences such as those described in the chapter "A Mixed Bag" are, one fears, a thing of the past; but some such red-letter day will come to everyone who tries hard enough. The description of the female of the *tahr* as a "ewe" seems strange, but as it has the authority of all those letters after the author's name one doesn't like to question it. There is a chapter on the Lesser Kudu in Somaliland.

By those interested in this subject nothing from Lieut.-Colonel Stockley's pen should be missed.

ANON.

SIX BRITISH SOLDIERS.

By THE HON. SIR JOHN FORTESCUE. (Williams & Norgate, Ltd. Price 12s. 6d.)

This is an account of the careers of six typical British soldiers, which shows how they had to make the armies which they used, and how they often had also to make the policy to fulfil which they were employed. Cromwell, Marlborough, Abercromby, Stuart, Moore and Wellington, had each to face the difficulty which is inevitable in the case of a British Army in a large war. The military forces maintained in peace are always inadequate and must be expanded. Such expansion in the days when a reserve did not exist was carried out by all sorts of expedients, all of which filled the army with untrained officers and men of very doubtful value. The commander had then to form and train from this indifferent material the force he was to use.

Nor was this the only difficulty. Generally the war involved co-operation either with the Navy or with foreign allies, with every possibility of friction and misunderstanding. Such difficulties would have been less serious if there had been always a definite policy outlined by the government. But "there has rarely, if ever, been an efficient directorate of war in London, and perhaps there never will be." In consequence, these British commanders often had to help to frame the policy which they, with their armies, were to put into effect.

How each in his own way dealt with the difficulties makes most interesting reading. It shows very clearly that the personality of the Commander has an enormous effect, both in the making and training of troops and in their employment. This effect did not end with the armies of the day, but lives on in the spirit and traditions of the army as we have it now.

This book adds one more to the series for which the army is indebted to Sir John Fortescue, and it is one which all soldiers can read with profit and enjoyment.

N.W.N.-C.

THE LIFE OF GENERAL LORD RAWLINSON OF TRENT, G.C.B., G.C.V.O., G.C.S.I., K.C.M.G., FROM HIS PRIVATE JOURNALS AND LETTERS.

Edited by MAJOR-GENERAL SIR FREDERICK MAURICE, K.C.M.G., C.B., LL.D. 1928. (Cassell & Co. Price 25s.).

This is a book worth reading. Sir Frederick Maurice was perhaps fortunate in the material he found available for the history of Lord Rawlinson's career, but he has made good use of it, and, incidentally, has increased his own reputation as a biographer.

The lives of great soldiers and great statesmen are usually worthy of study, and repay the reader. The *Life of Lord Rawlinson* is of special interest, for not only was he a very distinguished soldier, but he proved himself also to be a great statesman in the way that he handled the problems of India in his capacity of Commander-in-Chief and military adviser to the Viceroy.

His death is a national loss, and the loss is the greater coming, as it did, at a time when the future of India was about to go once more into the political melting pot. This record of his life will make a good many people, who thought they knew all about "Rawly," realize how little they knew of his great qualities. "It was," writes Sir Frederick Maurice, "a misfortune for his reputation with some of his contemporaries, as well as for the State, that he died a comparatively young man —he was only 61—in the fullness of his powers, for later achievement had not had time to outweigh fully early impressions."

Naturally a large portion of the book is concerned with the Great War. This will be of particular interest to those who served with him in France, for Lord Rawlinson had views on most of the problems which have been so widely discussed since the Armistice. But the real value of the book is to be found in the two concluding chapters on the Defence of India, and entitled "The Problem" and "The Solution." Readers of the earlier chapters will soon recognize the qualifications which Lord Rawlinson possessed to enable him to take a leading part in the discussions with the Government of India on the future of the Army in India and the Defence of India, which are described in the subsequent chapters. Those qualifications came partly as a gift of heredity from his distinguished father, and partly as the result of close intercourse with many of the men who had studied the subject on the spot for the last half-century. The story of the development of the young soldier who discovered ambition as a subaltern in India on the North-West Frontier in 1884, and achieved his ambition by being Commander-in-Chief in India before he was suddenly cut off in the zenith of his career in 1925, is a most interesting one for anyone to follow, and should be read by every officer who looks forward to service in the East.

H.B.-W.

SOME RAMBLES OF A SAPPER.

By Brig.-General H. H. Austin, C.B., C.M.G., D.S.O. (Edward Arnold & Co. Price 16s.).

In these pages we must not expect to find the Broken Soldier telling us how fields are won. General Austin is rather a Ulysses who, wandering from clime to clime, observant stray'd. And yet here are no Syrens, no Nausicaa, and so perhaps it were best to liken him to the Kindly Uncle, whose stories may be trusted to enliven the dull hour before bedtime, now summer-time is ended. True to this type, he promises us even more exciting tales on his next visit, for he has reserved his adventures during four expeditions in the Dark Continent for a future volume. Sympathetic readers will follow the General's career in this book with considerable interest, and regret that it came to an end so prematurely.

F.E.G.S.

FOUCHÉ, THE MAN WHOM NAPOLEON FEARED.

By Nils Forssell. Published in 1925 and since revised. Translated from the Swedish by Anna Barwell. George Allen & Unwin, Ltd. 1928. (Price 12s. 6d.)

In training oneself, or teaching others, to become an efficient member of the Intelligence Branch of the General Staff, it is difficult to find books dealing with the methods of the famous secret service agents of history or furnishing any guide to the training by which those methods were developed. For obvious reasons, they or others destroyed their detailed records, and we have to be content with studying maxims, dating from centuries B.C., which have from time to time been collated. Maxims are all very well, but one requires more than a knowledge of principles to develop into a successful Intelligence Officer. It was in the hope of at last finding a key to the acquisition of this knowledge that one greeted the publication of this "Life of Joseph Fouché," the famous secret service agent and Minister of Police of the Revolution and Napoleonic era. Frankly, one is disappointed, and not for the first time. But this study of Fouché's life and character is worth reading. To most of us he is known as the most famous "double spy" in history. The "double spy" is no new development. The *Book of Sonshi* mentions him. One wonders whether Fouché had access to the translation of that work by the French Jesuit missionaries in China in the eighteenth century, a copy of which was at once produced by the late F. J. Hudleston in the W.O. when Calthrop's English translation of a portion of the book reached his library from Japan in 1904–5.

The volume before us is an attempt to show the development of Fouché's character from earliest youth, and how he achieved success, if success it can be called. The writer succeeds in giving us a most interesting narrative of a life which must have been crammed with excitement and was certainly fraught with danger. He also gives us, in an appendix, a complete bibliography of books dealing with Fouché and his times, which will enable the student to learn some of the details of Fouché's

methods. Fouché was a political spy first and foremost. His activities embraced the whole of Europe and the British Isles. The amazing feature of his career is how he contrived to earn the confidence of the principals of both sides in the many intrigues in which he had a finger, and how by his farsightedness he managed to anticipate the course of events, and so came out on the right side after each crisis. He was a wonderful judge of character, and could sum up a man, or a woman, with unerring precision. Woe to the spy who served him badly! Born of Breton seafaring folk, he began life as a teacher, after teaching himself to be a mathematician.

Mr. Nils Forssell traces the development of his character, and rather inclines to a more generous view of his actions than is accorded him by most of those who have written about him. He sums up as follows :—

"The delicate little teacher was a precocious youth, with a brain that "quickly registered without effort his observations in the schoolroom, "and exercised supreme control over subjects of study, conversation and "outward behaviour. His class offered a fruitful field for psychological "experiment and observation, for, as a member of the Oratorian Order, "was it not his duty to guide every pupil to the goal most fitted to his "natural gifts? Thus Fouché tested on living, growing material the "theories which he had formulated concerning human vices, passions, "and dreams. . . . There is always a decided touch of the pedagogue "in Fouché's not unkindly sarcasms, and in the unfailing deliberation "with which he met even the smallest of life's happenings. He is calm "in storm, and ready with the least expenditure of force to deal with "disturbing situations, and by a wise admixture of pardon and punish-"ment to restore order once more. If at last we ask how this man, "with his delicate physique, was able to endure the constant upheavals "of this terrible time and to survive its unceasing storms, we shall, "perhaps, find the most credible answer in the great help of the regular "methodical work that upheld Fouché through fair and foul weather, "and never failed to steady his estimate of favourable prospects and "risks. Of the many personal associations that Fouché made, there was "never one that he willingly dropped. It has been noticed that a "constant feature of Fouché's personal policy was never to make "enemies, for in his opinion nothing was so calculated to complicate and "envenom any situation as feelings and prejudices of so unreasonable "and inexplicable a nature. He declared that nothing could be more "contemptible than to allow changes of fortune to affect personal "relationships."

The book is perfectly translated, and might have been written in English. The Index is hardly complete enough to be of real value.

H.B.-W.

ON FUTURE WARFARE.

By COLONEL J. F. C. FULLER, C.B.E., D.S.O. (Sefton Praed. Price 12s. 6d.)

This volume is made up of reprints of articles contributed by Colonel Fuller to various service magazines between 1919 and 1927. The

majority of the material is, therefore, not new to students of the military profession.

The eighteen chapters cover a wide field, from consideration of tactical and strategical principles to discussion of the employment of the various new mechanical developments in the field.

Colonel Fuller is well known for his advanced, or even futuristic, views on the art of war, and one may, therefore, approach his writings with a certain expectation of finding therein violently revolutionary doctrines. If such an idea is entertained, it will speedily be dispelled. The first chapter, on the principles of defensive warfare, reprinted from the *R.E. Journal* for June, 1925, might almost have been written by one of the General Staff against whom the author inveighs so continuously. The fact is that Colonel Fuller accepts the principles of *Field Service Regulations*, and attempts to apply them according to his own ideas. So obsessed is he, however, with his own doctrines, that he apparently loses sight of those of others. This is exemplified by his statement, in the footnote to page 93, that the following principles of war were adopted by himself before the publication of his book, *The Foundations of the Science of War*, in 1926:—The principles of the Object, Offensive, Security, Concentration, Economy of Force, Movement, Surprise, and Co-operation. We seem to have seen something similar in *Field Service Regulations, Vol. II*, 1921! Colonel Fuller is, therefore, not so heterodox as some, including himself, would try to make out.

Some may not be able to keep pace with his deductions as regards future war, but, as we all start on common ground, we can each see how far we can travel along the road with him. Frankly, in the majority of these articles we can travel almost all the way, even though we may not accept some of the author's arguments, or his more sweeping assumptions. From a certain limited standpoint Colonel Fuller is undoubtedly right, but he neglects, or rather cursorily discounts, certain important aspects, such as the policing duties of the army in India and in certain other parts of the world.

It is perhaps in the psychological discussions that we are least convinced by Colonel Fuller's arguments. The new weapon invariably produces insensate terror in the enemy, older ideas are met by ridicule. The picture of the war of the future in Chapter XIII seems to indicate that increase in mechanization will necessarily produce a lamentable state of "nerves" among the armies of the future. We feel that the author is rather like a psycho-analytical doctor who has no real understanding of the individual. His psychology is based on too rigid rules, and lacks the true milk of human kindness. Doubtless the author possesses this excellent quality, but it does not ring true in his book.

Space does not permit of a detailed analysis of the various chapters, but we feel that they will repay very close study. We have each got to make up our minds as to the warfare of the future. Our decision must be based on a full appreciation of the principles of war and an understanding of the various factors which tend to change its practice. We can imagine no better way to reach a decision than to read this book a chapter at a time, not in the spirit of carping criticism or blind conservatism, not in a spirit of revolution, but with a determination to elucidate the truth.

If we examine every argument, and compare every statement with the facts as known, we will be able to form a judgment of our own which we venture to think will coincide in many important points with that of Colonel Fuller.

But, where we agree, let us remember we have not reached that degree of mechanical efficiency which Colonel Fuller frankly admits as futuristic, and when we have achieved it we have still much to do to solve the many administrative, tactical, and directional problems entailed.

AIRMEN OR NOAHS.

By REAR-ADMIRAL MURRAY F. SUETER. (Pitman. 25s. net.) Reprinted by permission from *Times Literary Supplement*, August 30th, 1928.

A year ago, in *The Great Delusion*, certain strong and disturbing views were expressed by a writer under the name of " Neon " on the civil and military policies of aviation. He questioned what he called the " strange doctrine " that aircraft are of vital importance for transport in peace, and that they will be the decisive factor in the next war. The reasons for his opinions concerning airships were supported by what were stated to be facts and figures which, if correct, corroborated his view that all airship work on the part of the State should cease completely, and that those who believe in the future of these vessels should look elsewhere than to State funds for financial support. " Neon " deplored similarly and for fundamentally analogous reasons the sums lavished in subsidies upon civil aviation. The test he applied to the practicability of the civil uses of aeroplanes was the purely economic one. If traders or private individuals consider aeroplanes indispensable or desirable, and are willing to pay for them, private enterprise will infallibly produce the supply, as it had in other forms of transport. " Neon's " third principal point was that the bombing of towns by aircraft is indiscriminate, barbarous, a bad policy even when used against " native " races, and, in the long run, a futile one. He did not by any means deny the value of aircraft for ancillary purposes, such as spotting for artillery, long-distance scouting at sea or reconnaissance on land, dropping food to beleaguered garrisons, or moving small bodies of troops. But he claimed that the expenditure of money between 1919 and 1926—£160,000,000—was unjustified either by its results, by any principles of economics, or by the well-established theories of war. Finally, he made some critical remarks upon the utility of the Home Defence Force. That force has as its *raison d'être* the defence of London against air attack. Drawing his conclusions from remarks by persons in high authority, " Neon " came to the conclusion that those forces which Parliament votes for the purpose of the defence of London are not intended to be used to prevent the city from being bombed, but to make war of their own upon enemy civilians, leaving the real defence of the city and its inhabitants to the guns and searchlights of the Territorial Army and the nerves of the people.

Such, in broad outline, were the principal indictments of aerial policy

brought by " Neon ," and it is to refute these " extraordinary, inaccurate and unusual " views that Admiral Sueter tells us he has written *Airmen or Noahs*. It is, however, difficult to believe that this alone has actuated him : for it was not necessary, in order to refute those views, to conduct a continuous stream of invective against the Admiralty of the pre-War period and against the Admiralty shipbuilding policy of to-day ; nor to give us one whole chapter describing his own share in the development of the tank, another on his proposal to establish a Ministry of Defence and yet another on the Schneider Cup. None of these can be said to be relevant in any degree to " Neon's " criticisms ; while the personal note and what can only be called the cheap ridicule with which he attempts, with much repetition of phrase and example, to cover the officers of the Admiralty, are as eminently distasteful to read as they are unconvincing so far as his thesis is concerned. For they prove nothing and have no bearing on the Neonic theories.

Admiral Sueter's initial aim is to show that aircraft made a contribution to victory. We had believed that this was fully recognized and in need of no proof—though Mr. Pollen certainly offered an opportunity for criticism in his remark in the Preface of *The Great Delusion* that that contribution was " pretty hard to find." To this object he devotes a chapter on Naval Aviation which describes some of the feats of the naval airmen in the air and on the land. Fine work was done by these officers, as he shows. But this has been done—and, we might say, with greater skill—by the late Sir Walter Raleigh. The sections on " Should Submarines be Abolished? " " The Blocking of Zeebrugge," " Should Battleships be Abolished ? " have in reality nothing to do with the question. Where he might well have enlightened us he does indeed refuse to do so. After describing in some detail the minor details of the life at Otranto, and giving the congratulatory letters of which he was the recipient, he leaves us in the dark as to their results. " Whether our air efforts in the Lower Adriatic were of value, others are better judges than I am." But since the aim of the book would seem to be to inform the reader of the value of such operations as these, this conclusion can hardly be described as adequate or convincing.

On the subject of airships, and " Neon's " views that State assistance to their construction should cease, Admiral Sueter replies with a description of his own activities in attempting to get airships built before the War, in the face of obstruction by the Admiralty ; of accounts of flights made in airships on several occasions ; and of a positive statement that the German Zeppelins enabled the German Fleet to escape after Jutland. The evidence upon which Admiral Sueter makes this statement—and he is so convinced of its importance that he prints it in leaded type—appears to be a statement by a German, who quotes an American, who quotes a " secret " British report that the Zeppelins saved the German Fleet. Before making this claim, Admiral Sueter would have been very well advised to study the battle and verify the possibility of the statement being true. The fleets were over thirty miles apart at the time of the sighting of the Zeppelin and the British Fleet would have had to steam at a speed of not less than 65 knots to intercept the enemy before he entered the minefields. Not less inaccurate is his statement that the Germans

kept the whole North Sea under close observation with their Zeppelins. Jutland and the movements of the convoys are among the many proofs of the extravagance of this remark.

To " Neon's " contentions that airships are lacking in carrying power, and that in consequence they suffer from economic inability to function commercially, and of their liability to injury and other matters, Admiral Sueter offers no reasoned reply. The airmen, he tells us, desire to link up the most distant parts of the Empire by air—a wish admirable in itself. " Neon's " point, however, was not whether such linking up is desirable, but whether the State should spend money upon uneconomic enterprise. To be sure, to Admiral Sueter's mind, the enterprise is not uneconomic ; it is an investment of the people's money, by the State, in an eventually more profitable, because well-peopled, Empire. His arguments are those invariably used by the technical enthusiast. His claim is that the State should spend its money, at the dictation of a small body of such enthusiasts, upon an undertaking the success of which is, even in his own opinion, open to doubt. The taxpayer, in Admiral Sueter's opinion, ought to feel fully compensated for the loss of his money, if the experiment fails, in the satisfaction he will derive from the fact that its energetic protagonist " has made a big endeavour to solve a great air problem." The taxpayer, however, has a tendency to desire some better return for his savings than a Platonic satisfaction.

The view that the specialist should dictate a national or a departmental policy informs much of his argument. It is accompanied by a not uncommon concomitant : that wars are won by material. " History," he confidently remarks, " teaches us that success in war has been in part due to those who adapted the science of the period to produce a new weapon—a flint axe, a spear, or some form of protection." From precisely what events in palæohistory Admiral Sueter draws his lesson we are not told ; but it would be equally interesting to have chapter and verse for his statement concerning events of a more recent date. To what " new weapon," for example, did Marlborough or Turenne, Napoleon or Moltke, Frederick the Great or Nelson, Chatham or Carnot, owe their remarkable victories ? The material side is unquestionably by no means negligible ; but it is far from embodying the art of war to the extent Admiral Sueter supposes. A prodigous employment of material, as a French general has recently pointed out, did not give victory either at the Somme or at Verdun ; what was lacking was skill in leadership ; and that will never be replaced, however much it may be assisted, by the submarines, tanks and aircraft which the Admiral appears to suppose to be the queens of battle and war.

If " Neon's " book disturbed the minds of many, Admiral Sueter's can only increase that disturbance. Confidence in any defence of a policy depends upon the accuracy of facts, the sobriety with which they are used, the manner in which the several criticisms are met, and the avoidance of irrelevance, heat, or personal feeling. The characteristic features of this book, which cripple it as a serious contribution to the study of a problem of profound interest and importance, are the striking absence of reasoned argument, the loose statements, the irrelevant narrative and the acrimonious invective ; and a sense of humour, verbal

and pictorial, of a kind thoroughly enjoyed in the early period of our schooldays. Perhaps the most succinct summary of the aims of the book occurs in the author's own preface, in which he quotes his typist as saying, " How much you must have enjoyed writing every word of it, and *didn't you get your own back on the Noahs!* "

[*The Great Delusion was reviewed in The R.E. Journal for September, 1927.—Ed.*]

SURVEY OF INDIA, GENERAL REPORT, 1926 TO 1927.

FROM 1ST OCTOBER, 1926, TO 30TH SEPTEMBER, 1927.

Published by order of Colonel Commandant E. A. Tandy, R.E., Surveyor General of India.

This report follows the general lines of the previous annual reports of the Survey of India.

As the result of the recommendation of a Committee appointed by Lord Curzon in 1905, the department was to have devoted all its energies from that date to the production of a new series of topographical maps of India on a scale of 1 inch to 1 mile. Though this series was designed to be completed in 1930, owing to lack of funds, and delays due to the War, not more than half the task had been completed up to last year, in spite of the fact that the scale of survey has been reduced. To quote the words of the report, " though new surveys covering an area about equal to England are carried out every year, maps of half the country are still very old and only kept up to date roughly by means of rather perfunctory information supplied by local officials." Maps dating before 1905 are not thought worthy of a place on the index charts. This is certainly an unsatisfactory state of affairs, which is unfortunately due to lack of foresight on the part of our administrators, and it is not confined to the mapping of India only. As a result these " new " maps of India are in part over 23 years old and, if things go on as at present, will be some 45 years out of date before the next revision takes place.

For some reason, our rulers can never be made to appreciate what a country suffers economically from the want of up-to-date maps; this especially applies to new countries awaiting development, the progress of which is undoubtedly hampered in many directions where no accurate maps exist.

It is not easy to see how the maps of a great area like that of India can be kept reasonably up-to-date, unless the more rapid method of aerial photography is largely adopted.

Perhaps the most notable event of the year under review is the completion of the first topographical survey of Nepal, which was begun in 1924. In that year, H.H. the Maharaja of Nepal asked for the co-operation of Indian Surveyors in the preparation of a complete modern map of the whole country, the completion of which has made a most important contribution to Himalayan geography, and has given us an accurate knowledge of the drainage and mountain structure of some 55,000 square miles of practically unknown country, embracing some of the most elevated regions of the world, including Mount Everest itself.

The field work was carried out on a scale of 4 inches to 1 mile. A skeleton map, showing watersheds and drainage on a scale of 1,500,000, has been reproduced with the report. Considering the many difficulties which had to be overcome, both climatic and topographical, the mapping of Nepal is no small achievement, and reflects great credit on all concerned.

The observatory at Dehra Dun has co-operated with other national observatories in the simultaneous determination of longitudes by means of wireless time-signals, which was organized by the International Longitude Commission. It is of interest to know that the determination of the longitude by wireless time-signals occupied two months, while by the old method, using telegraph lines, it occupied some two years. The latest value only differs from the former value, determined about 30 years ago, by 0·02 seconds of time, or about 10 yards in the relative position of Greenwich and India, regarding which the report remarks, "during the last 30 years there has been no measurable change in the longitude of India of the type involved in Professor Wegner's hypothesis."

An account is given of the exploration of the Shaksgam Valley by Major K. Mason, M.C., R.E., when about 1,500 square miles of new ground was surveyed by the plane-table, and this area will be increased when the photographs taken have been plotted by the Wild Stereo-Autograph. A full report of the scientific results of the expedition will be published later on.

It is a matter of regret that other survey departments do not follow the excellent example of the Survey of India and publish reports of exactly what they are doing, as a great deal can be learnt by an interchange of this kind of information.

H.L.C.

SURVEY OF INDIA, GEODETIC REPORT, VOLUME I.

FROM 1ST OCTOBER, 1922, TO 30TH SEPTEMBER, 1926.

Published by order of Colonel Commandant E. A. Tandy, R.E., Surveyor General of India.

This is the first volume of a new series of Geodetic Reports to be issued by the Survey of India. It deals with the scientific work of the Survey for the four years ending 1926 carried out by the Geodetic Branch, formerly known as the Trigonometrical Survey. It was under this name that it created for itself a world-wide reputation and some may regret the abandonment of the historic title, but we live in an age of change.

Probably no survey in the world has been engaged more consistently, or for a longer period, than the Survey of India on the scientific side of the subject, including the Great Trigonometrical Survey, on which the whole mapping of the country is based. This period extends from the time of Sir George Everest, who served from 1823 to 1843, to the present date.

We believe it is correct to say that, if the Geodetic Triangulation of India were to be re-planned to-day, it would take very much the form that

Everest devised more than 100 years ago, though, of course, modern and much improved instruments would be employed. The Indian Survey was indeed fortunate to have had such a man guiding its scientific work at that early date, and it is true to say that the traditions he established have been worthily carried on through a series of able men who have succeeded him. The work of this Branch is grouped under the following heads:—Computing, Tidal, Observatory, Magnetic Observations, Gravity, Latitude, and Levelling.

The report, which treats of each in detail, should be of the greatest value to those interested in these subjects. It would be impossible in the course of a short review to notice all the items of interest with which this volume is filled; it is, therefore, proposed to refer only to a selected few.

A remarkable chart has been drawn in the form of a map of India contoured so as to show the separation of the geoid, or the equipotential surface assumed by the ocean, and the spheroid, or the theoretical shape, as computed by Everest, which the earth would assume were it homogeneous, and not distorted by local attraction.

Owing to the neighbourhood of the Himalayan Mountains and the great mass of the Tibetan Plateau, this separation amounts in places to over 250 feet.

The chart in effect summarizes an enormous amount of field work and computation extending over years, and puts it into a graphic form.

A work of much importance to shipping in Indian waters, the Red Sea, and the Persian Gulf is undertaken by the Survey of India in the preparation of tide tables for some 43 ports, predicting in advance the times and heights of high and low water. Since the Tide Predicting Machine was transferred from England to Dehra Dun, Dr. de Graaf Hunter has introduced many improvements with a view to simplifying and shortening the work involved. Also an ingenious addition has been made to the Predicting Machine, by which the times the predicted height of the water reaches various selected heights above datum can be recorded. It is thought in some cases this extra information will be useful to shipping and to harbour authorities.

As is well known, the Survey of India has devoted much attention to questions connected with the physical constitution of the earth's crust, especially the mechanism of mountain building. Shafts and boreholes merely touch the fringe of this subject, as they can only penetrate to a comparatively small depth. Other means must, therefore, be devised by probing deep down into the crust. These present themselves in the form of the differences which have been found to exist between the spherical co-ordinates of places as determined by geodetic triangulation and by astronomical observations, and also by the anomalies displayed in the values of gravity derived from pendulum observations. Round these have grown up a considerable literature, and a theory known as the Theory of Isostasy has been propounded.

Those who wish to know what is being done in India with regard to this very interesting, but somewhat technical, subject are recommended to consult this report.

In passing, it may be mentioned that the introduction of wireless time-

signals has greatly facilitated the determination of astronomical longitudes which form part of these investigations. It is also pleasing to note that we have at last established a wireless station at Rugby, broadcasting accurate time-signals which can be heard all over the world, making our Surveyors no longer dependent on foreign stations for their time.

As an accurate triangulation is of the greatest economical value to a country, so is an accurate and reliable system of spirit levels. They are not only essential to the making of maps, without which a country cannot be properly developed, but are of great use in engineering schemes affording reference data on which to base them. Accurate levels are now being extended into all parts of the country where public works call for them, and these are many in a land in which irrigation plays such a large and important part.

It is gratifying to see in the Survey of India a happy blending of highly utilitarian operations with scientific investigations, which might well be followed by other Surveys of the Empire.

As a comparatively new instrument of much interest to Surveyors, the prismatic astrolabe has been brought into use. With this instrument it is possible to determine latitude and local time in the same operation. Under favourable conditions, the report says, results comparable in accuracy with those of the Talcott method can be obtained. The chief advantages of the instrument are :—

(*a*) Simultaneous determination of time and latitude.
(*b*) Great portability and easy erection.
(*c*) Simplicity of observation.

The observations, however, were not so favourable when unsettled weather conditions prevailed, such as are met with in Himalayan regions, one part of the sky being clear, and the other part misty. Persistent errors were found to accompany this kind of weather. We think it is possible that the effect of these conditions is accentuated by the greater zenith distance at which the stars are observed compared with the Talcott method, when observations are taken in the meridian and close to the zenith. The instrument, however, may be considered as a welcome addition to the Surveyor's outfit and, together with the time-signal receiver, he is now able to find his longitude and latitude anywhere with much greater ease than formerly.

Before leaving this volume, we should like to draw attention to a lecture delivered by Dr. J. de Graaf Hunter at the Indian Science Congress at Madras in 1922, dealing with the height of Mount Everest and other peaks, which has been printed as Chapter VI.

Only those acquainted with the technique of the subject are aware of the methods employed and the uncertainties which surround the determination of the heights of inaccessible mountain peaks, which can only be viewed often from a great distance. Of all the various methods of determining height only one is available in this case, namely, the observation of the angle of elevation of the peak from a point of known height and distance. This sounds easy enough, and so it is, but the matter does not rest there, for we must take into account not only the effects of refraction, the Surveyor's bugbear, but the effect of local attraction on

the value to the angle of elevation at the point of observation. All these have been carefully investigated and taken into consideration by the author of the paper under review, and he comes to the conclusion that the height of Mount Everest above the spheroid is 29,149 feet, with a probable error of 4·6 feet. Since the difference between the geoid and the spheroid varies from place to place, and its amount can only be estimated at Mount Everest, the final result of the height of Everest, above the geoid, is 29,080, with a possible error of 30 feet.

When the original value for the height of Everest was determined at 29,002 feet from observations in 1849–50, the effect of refraction on long rays was not so well understood as at present, nor, we believe, were the plumb-line deflections taken into account. It depended, as far as we remember, on about 113 observations taken from the plains of India at distances varying from 108 to 119 miles.

The investigation of the height of Mount Everest is not only interesting because it is the highest point on earth, but because it raises the question of exactly what we mean when we speak of height above mean sea level. For engineering purposes two points are said to be at the same level when, if we were to dig a canal between them, there would be no tendency for water to flow in either direction. In other words, they are situated on the equipotential surface, or geoid, passing through them. If one of these points is the station of observation, then the angle observed to the peak, cleared of refraction effect, is the angle of elevation measured from the tangent to the surface of the station. The height of the station is obtained by means of spirit levelling from mean-sea-level, which, for practical purposes, follows up the geoid from the sea. By this means we obtain the height of the peak above the geoid, as it exists at the station of observation, but what this same geoid may do on reaching the distant peak is a matter of conjecture. We believe, therefore, the determination of a height such as that of Mount Everest, does not admit of an exact solution, though the one given is probably not far from the true height.

H.L.C.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH. BUILDING. RESEARCH BULLETIN NO. 3.

EFFECTS OF MOISTURE CHANGES ON BUILDING MATERIALS.

By R. E. STRADLING, M.C., D.SC., PH.D., M.INST.C.E.

(H.M. Stationery Office. 1s. net.)

An attempt is made in this Bulletin to summarize the principal relationships between water and constructional materials, and to indicate the results arising from these relationships.

Water, it states, can be present in building materials in three ways, namely (1) in chemical combination, (2) as free water, and (3) as "sorbed" water.

The first is analogous to the water utilized in slaking quick-lime, an operation in which the relative quantities of lime and water are fixed, and the chemically combined water can only be induced to leave the solid by breaking down the compound.

The second is water associated with the material in such a way that its properties remain for all practical purposes unchanged. It remains thus associated only so long as the external conditions of the system are those of complete moisture saturation.

The last is the condition least known to users of building materials, and is intermediate between the other two. That is, the water, without forming a definite chemical compound, is held more firmly than free water, with a corresponding alteration of its properties, *e.g.*, boiling and freezing points. There is a definite relationship between the external humidity conditions and the quantity of water held in equilibrium in the solid. The application of the term "gel" is suggested to those materials, which have the power of "sorbing" water, with a corresponding increase in volume of the material.

The following effects of chemically combined and free water are explored:—Direct disintegration; solution; osmotic pressure; transmission; evaporation, efflorescence and crystallization; frost and the effect of freezing.

The influence of sorbed water on expansion, Young's Modulus, and breaking strength, is investigated, and a number of curves are given illustrating the results of experiments with regard to timber (ash), sandstone, cement, concretes, clay bricks and artificial stones.

A tabulation of the results of Professor MacBain's experiments, undertaken to determine whether the classification, as "gels," of those materials, which swell on contact with moisture, leads to the conclusion that the term is applicable, provided that it is recognized that they are of the "rigid," rather than the "non-rigid" category; the expansions due to this property are stated to be frequently greater than any temperature movement likely to occur in this country, and the danger of associating two "gels" of different expansion values is pointed out. A paragraph is also devoted to the irreversible changes brought about by the addition of water to such "rigid gels" as cement and concrete, and a possible explanation of the phenomenon of crazing deduced.

The effect of temperature changes on "gel" structures is illustrated by a table of the physical properties and permanent alterations in length, due to heating and cooling, of various sandstones, limestones, marbles, granites and mild steel, and it is pointed out that a general property of "gel" structures is the difference in the coefficients of thermal expansion in the wet and dry states.

The bulletin concludes by expressing a hope that, without losing sight of the general effects of moisture changes, special attention will, in the future, be paid to "sorbed" water relations.

A.D.C.

INTRODUCTION TO THEORETICAL PHYSICS.

By A. HAAS, PH.D. Translated by T. VERSCHOYLE. Vol. I, 2nd Edn. revised.

(Constable & Co. 21s.)

Physics of to-day is the forerunner of the engineering of to-morrow, and so it behoves every engineer to keep abreast of advances in physics.

Unfortunately, time and opportunity are usually lacking, but this book is a good guide to the subject, and presupposes little but general mathematical knowledge.

The first part of this volume deals with the mechanics of a particle and of a rigid body, and with vector fields and wave-motion, leaving the theory of electromagnetism and light to be covered in the second part. Vector analysis is used as the basis of treatment throughout, its principles being very well, though briefly, explained in chapter one. This powerful weapon of mathematics is not in as general use as it should be. It was developed in a cumbersome form thirty years ago, by Hamilton and Tait under the awe-inspiring name of quarternions, and Heaviside was the first engineer to tame and use it for practical purposes. It has since been handicapped by the variety of notations employed by different writers, and the difficulty of writing vectors in manuscript. The notation employed by Dr. Haas is simple and clear, and the few small misprints are none of them of sufficient importance to fog the reader. Dr. Haas is to be congratulated on his avoidance of determinants, which most writers on vector analysis introduce into their treatment with no other result than to confuse the beginner.

Other points clearly explained in part one are the mechanical principle of relativity, the meaning of " degrees of freedom," and of tensors.

In part two, the theory built up in part one is applied to electricity and to light. It is interesting to the engineer to see how the fundamental laws of physics, which were first discovered empirically, can be derived to a large extent from considerations of theory alone. The electromagnetic field is merely one example of vector fields in general, and before going on to part two a reader should thoroughly master chapter seven on potential. The theory of light is built up from Maxwell's equations and Fresnel's theorems.

If volume two proves of equal merit to that before us the work will undoubtedly be the clearest book written on theoretical physics. Most engineers would probably benefit by more numerical illustrations. It is frequently necessary to refer back to previous paragraphs, and this would be much easier if the numbers of the paragraphs were shown at the top of each page.

K.H.T.

CAR MAINTENANCE AND REPAIR.

By A. W. JUDGE. (Chapman & Hall. Price 4s. net.)

This book is the fourth volume of a series called *Motor Manuals*, by the same author. It contains much useful information and advice for the user of motor vehicles (especially the owner-driver and the owner-driver-mechanic) concerning the maintenance and repair of a modern motor car. Chapters are devoted to the engine, chassis mechanism, tyres, electrical system, bodywork and upholstery, storage of the car, diagnosis of engine trouble, the text being very well illustrated with outside views and sections of parts of the better known makes of car.

The needs of the ordinary owner-driver have been carefully studied in

this work, the language used being simple, and the order of arrangement of the subject matter logical.

The reader is assumed to know the broad outlines of how a car works, and the names and functions of the more important parts, and, given this knowledge, it will not be at all necessary for him to acquire the three previous volumes of the series (which are devoted to the working of the engine, carburettor, and chassis mechanism respectively).

As regards the value of the information and advice given, it should only be necessary to remind readers that the author is one of the most famous authorities on petrol engines, and he claims experience of motor vehicles covering a period of about 20 years.

Many owner-drivers, as a hobby, and many for financial reasons, elect to do much repair work themselves, and to these the book can be specially recommended, as giving sound advice as to what they can and what they can't tackle, how to tackle it, and the tools that will be needed. In this connection it should be noted that there is useful information concerning the layout and equipment of the garage, which will be particularly valuable to those who intend to work in it themselves.

The following is a list of some interesting items dealt with, which the average owner-driver knows little about :—

> Detecting worn bearings by sounding rod ; quick cylinder decarbonization by burning with oxygen ; filling main bearings, both main and connecting rod ; testing and trueing crankshafts ; fitting new pistons ; carburettor adjustment ; non-freezing solution for the radiator ; causes of noisy gears ; suspension spring flattening, with effects and cure ; alignment of front wheels ; care of the battery ; storing the car.

It is to be regretted that the re-painting of cars is not dealt with. This is a job which could be carried out with satisfactory results by most owner-drivers provided they had a little information on the subject, and a little patience.

T.C.W.B.

RATIONAL MECHANICS, CHAPTERS IN MODERN DYNAMICS AND ENERGETICS.

By LIEUT.-COL. RICHARD DE VILLAMIL, R.E. (retired), author of *Motion of Liquids, Resistance of Air*, etc. Published by E. & F. N. Spon, 57, Haymarket, and Spon & Chamberlain, 120, Liberty Street, New York. (Price 10s. 6d.)

This work is partly a critical review upon the current theories of natural philosophy, and partly an exposition of the author's own views.

The subjects discussed comprise Dynamics, Relativity, Viscosity, Rigidity, Resistance of Liquids, etc.

A little of the criticism is captious, some of it destructive, but a great deal of it is so sound that I wish every Instructor of Elementary Mechanics could have a copy of it.

The chapter on Relativity is disappointing ; that observed rectilinear motion is relative has, of course, long been known, but the logical consequences of this fact had not been fully appreciated before the time of Einstein. Just as Newton was led to his theory of gravitation by the fall of an apple, so Einstein, pursuing the fact of Relativity to its logical foundations, arrived at conclusions both startling and strange.

The chapter on Viscosity and Rigidity is interesting but contentious. The definition of Rigidity is not that usually adopted. Colonel de Villamil endows liquids and even gases with this property, and his reasons for this are quite plausible.

The resistance of a liquid to a moving body is ably and logically developed from the Newtonian theory in Chapters X, XI, and the book ends with three excellent chapters on the Principle of Least Action, and and the Shapes of Least Resistance.

Colonel de Villamil is no respecter of persons or theories, and his book is admittedly contentious. It embodies the result of very extensive reading, considerable mathematical knowledge, and no small amount of thought. The standard of criticism is high.

The work is not a treatise but an exposition of the author's views on a variety of subjects ; these views are ably and clearly presented, and it is open to the reader to agree or disagree.

There is much of interest in the book, which is well worth careful study by those who, not being necessarily mathematicians, are interested in the foundations of Natural Philosophy.

J.M.W.

STRAIN ENERGY METHODS OF STRESS ANALYSIS.

By A. J. Sutton Pippard. Longmans, Green & Co., Ltd. (Price 14s. net.)

This book provides an excellent account of the various ways by which the stresses in structures may be calculated by the use of the methods due to Castigliano. The book should be useful to R.E. officers at Cambridge and elsewhere who are studying the theory of structures, although the application of the methods is more likely to devolve upon aeronautical constructors and designers of complicated steel structures than on military engineers. Rather will the book convince R.E. officers of the importance of ensuring that any frameworks which they may design contain no redundant members.

The examples worked out at the end are a valuable feature of the book. The application of the method to a wooden structure is interesting, though it may be doubted whether the results obtained are of great accuracy in view of the large number of assumptions made.

The notation used in the book is not always very consistent, and is nowhere very satisfactory. For example, P_1, P_2, P_3, etc., are used to represent external loads on a structure, whereas P_0 is used as a general symbol to represent the stress in any member. A little discrimination would have made the book considerably less confusing.

P.R.A.

MAGAZINES.

COAST ARTILLERY JOURNAL.

The July number contains an article on the effect of Permanent Fortifications on military operations in the World War. It recounts the effect and fate of various fortified centres on the western and eastern fronts, and concludes that any fortifications must eventually yield to the assault of an attacker drawing on all available resources, and also that ring fortifications are doomed to be ousted by a continuous line of field fortifications with flanks resting on an efficient obstacle, such as some inviolate frontier.

This question is intriguing the French Government at the present moment, and has led to the suggestion for the immediate construction of two or three wired and defended lines from the North Sea to the Riviera at a cost of many thousand million gold francs.

The Gallipoli Campaign is a very favourite theme for writers in this journal: the last one concludes that the landing failed primarily because the Turks had at all times superior strength available on the spot.

The military situation of Holland is described. The home land has a population density of 546 per square mile, making it one of the most thickly-populated countries of Europe. The famous windmills are being replaced by electric pumps which act more efficiently in keeping the dyked land surface drained. The transport system consists of canals, roads, and rails. Canals form a great net of inland waterway: roads are made along the tops of the dykes: the railway net connects up the principal cities throughout the country.

The population of the colonies is about 50,000,000—over seven times as great as that of the home land. The Dutch military policy is based on compulsory but not universal service. Every Dutch male between 19 and 40 years of age is liable to military service, but only those who are drawn by ballot to fill the annual quota need serve. The term of service varies with the branch in which the time is served.

The Colonial Army is distinct from the Home Army: it is commanded by the Governor General, and consists of white and coloured troops though not mixed in the same companies except in the Artillery, where the gunners are white but drivers coloured. In all cases the officers are white, and in most cases even the N.C.O.s are white.

Officers and men in the Royal Navy must serve a regular tour in the Far East. The colonies afford ideal naval bases in cases of war in the Far East, and as such, might become a temptation to other maritime nations.

Otherwise the only bone of contention, at the present time, is the command of the River Scheldt, which rises in Belgium but enters the sea through Holland. By the terms of an old treaty, Holland closed the Scheldt and then cut off the Belgian port of Antwerp from the sea, and, during this period, she increased the importance and trade of her own ports of Rotterdam and Amsterdam. Since the time of Napoleon, however, by a new treaty, Holland accepted the duty of keeping the Scheldt open, and this free passage enabled Antwerp to become one of the largest ports in Europe. But since 1918 Holland has become more and more remiss in clearing the channel, so that the banks are now seriously interfering with the traffic of Antwerp. The Belgian authorities have protested, and even offered to carry out the necessary dredging themselves, but the Dutch will not allow that, nor do they seem willing to do the work themselves. They also rejected a Belgian proposal for the construction of a canal to connect Antwerp with the Rhine mouth, and thus make her independent of the Scheldt. The Belgian Government has now referred the matter to the League of Nations: they feel that, though the mouth of the Rhine is in Holland, like that of the Scheldt, the Dutch would not care to take the same line with the very important international traffic borne by the German river.

In an article on the cruiser question, the writer explains his view of his country's needs: a first class navy, second to none, to ensure the inviolability of her merchant shipping in time of war, in every quarter of the globe in all circumstances.

The August number contains a description of the movement by rail of a 14-in. railway gun from the Aberdeen Proving Ground, Maryland, to Fort MacArthur, San Pedro, California. The weight of gun and mounting is 325 tons, and was distributed over twenty-eight wheels, giving approximately 11·6 tons per wheel. The journey covered 3,721 miles, crossed the Sierra Nevada Mountains, and took five-and-a-half weeks, which, however, included two hundred stops. These halts varied from a few minutes to ten days, and many of them were for propaganda, to enable the taxpayer to see the gun. Due to the poor condition of the bearings, the speed over the first part of the trip was kept down to about 10 m.p.h. Later, level tracks, with only slight curves, were negotiated safely at 30 m.p.h. At one time, a few miles were covered at 40 m.p.h., but an inspection revealed that the journals were dangerously hot.

The principal recommendations made after the journey by the officer in charge were as follows:—

(*a*) That journal bearings be at least 75% fitted before the mounting goes on the track. This would permit a maximum speed of 30 m.p.h. on the level straight.

(*b*) That the gun travel with muzzle to the rear instead of to the front.

(*c*) That a safety precaution be fitted to the elevating system between travelling and firing position, in case the normal raising screw should give way.

(*d*) That the gun car be so far divided from the loco, by means of flat cars, that both should never be on the same bridge span at one moment.

In a talk on the Signal Service in the American Army, the lecturer showed that the volume of messages increased more or less in the ratio of the square of the mileage from the front line. The fighting area carries fewer messages, but under greatly increased difficulty: the signal service is there obliged to duplicate and multiply each channel of communication with as many alternate methods as human ingenuity can devise.

The traffic in rear has a vastly larger peak, but the channels require less troublesome maintenance. The largest volume of all lies between General Headquarters and Company Headquarters, and this volume is much the same as that between General Headquarters and the Seat of Government.

Meanwhile the tendency is for the depth of the fighting zone, with all its difficulties, to increase until it may include practically the whole theatre of operations. This means an increase in the urgency of all messages within this area, and an increase in the hazard of maintenance.

Not only this, but early and accurate information of operations have now to be broadcast over an area, instead of being required only over a single line to the local control at the rear end of that line. Thus, news of an enemy air-raid has to be sent at once, not only to the infantry and artillery commands, but to the anti-aircraft organization further back, and the defence fighter squadrons which may be ten or fifteen miles to the rear. Formations now demand communication both with moving tanks in front and the still more widely dispersed motor transport columns in rear.

The cult of mobility has introduced an increased strain on the communication system.

More and more must power-driven contrivances be pressed into the service of the overburdened human: automatic writers, ingenious selectors, automatic exchanges: everywhere the cry is for a fool-proof automaton; we must beware the fate of Frankenstein.

This trend demands a far higher standard of training and brain power for the successful control of these robots, and raises the question of an efficient and automatic pool for the replacement of those brains.

Wireless is now required in the front line within the battalion area, and, as such, is manned by operators belonging to that unit. Is there an adequate supply of such in the casualty replacement system? That seems to be the present menace to Frankenstein.

The writer points out that technical equipment is now ahead of the ability of the average personnel to make use of it and keep it in good order. The regiment, battalion, or battery must now preserve the balance by attaining the capacity to handle and care for it. The spread of this education must be more general than is usually imagined, now that nearly ten per cent. of the military force in a theatre of operation is engaged in operating and maintaining the communication net. In the American Expeditionary Force 2% of the Army belonged to the Signal Corps, while 8% of the Army was made up of officers and O.R. of branches other than the Signal Corps, but employed on signal communication. For each and all of these individuals there must exist a functional replacement system, extending direct from the central training reservoir to the

most advanced unit, so that casualty replacement may be unfailing and automatic.

Into this scene of a trail of messages there gleams a ray of hope. The more highly trained and capable our commanders and their staff become, the more penetrating will be their foresight: the more strategically and tactically efficient our officers are, the more able are they to foresee and plan aright for the future: one message will do instead of three. This means less volume of work, and faster and better service: thus may we retain the whip-hand over our monster.

Industry and War.—At the outbreak of war, industry receives a serious shock. Millions of men are withdrawn from productive labour, and immediately become enormous consumers. Just when maximum production is required, a crippling blow is received by the industries on which we rely for our supplies. Industry must carry on with many green workmen, at the same time changing their product and increasing their output to maximum. Thus does the author of Industrial Preparedness for War state the necessity of planning ahead, in peace-time, to procure and manufacture, without delay and at minimum cost, the materials essential for carrying on a war. The Army and Navy Munition Board co-ordinates the requirements.

The United States has been divided up into procurement districts. Each district has a District Chief, a prominent civilian in the industrial world, assisted by an advisory board, and equipped with a clerical staff. Industries and factories are allocated to the corresponding production plan. Plant alteration is prepared on a factory plan which is agreed, and then tentative orders are indexed and issued.

On the outbreak, the War Department would notify each District Chief, from whose headquarters the authoritative telegrams would be sent to all producers to put into effect the pre-arranged plans for the production of war materials, and to approve the previously-agreed contracts. Transportation alone is left in the hands of private operation. It was taken over by the Government in the Great War, and much confusion resulted.

In an article on Recent Developments in Anti-Aircraft Artillery, the writer explains how their development is proceeding on the lines of the elimination of dead and profitless time. With the present accuracy of the gun and projectile, the outstanding object now is to cut down the useless period which must elapse between the instant of precise observation and the burst of the shell which was controlled by that observation.

The allowance of eight seconds for dead time was an average; it might have been six seconds or it might have been ten, but meanwhile the target is travelling at 50 yards a second. The less the dead and profitless time, the nearer is the future position of the target to its observed position, *i.e.*, the smaller is the radius of the sphere of possible displacement. The result to be aimed at is to make this sphere of possible displacement coincide with the sphere of rupture of the projectile.

The dead and profitless time is made up, first, of time taken in observa-

tion, computation, fuze-cutting and loading; secondly, the time of gun-laying and firing; and, thirdly, of the time of flight, which governs corrections for wind and atmospheric conditions, etc. The first error is said to be decreased by the use of the new electric data-transmission dials from eight seconds to one-and-a-half; the second by the follow-the-pointer system, in which the gun is always laid. By this method there is said to be no appreciable increase on the one-and-a-half seconds of dead time allowed for computation, etc. The third error is decreased by the gain in muzzle velocity, which has been increased to 2,500 f.s. in the new 3-inch gun. It is claimed that this elimination of time error has doubled the average percentage of hits obtained. Guns are now kept continuously set at the proper elevation and azimuth, by torque amplifiers; these are driven by small motors, and are operated automatically from the distant observing station.

Continuous fuze-setting and improvement in the breech mechanism have enabled the standard rate of fire to be increased to 84 rounds per minute from a four-gun battery, with a maximum rate up to 110 r.p.m. at times.

A 4-inch A.A. gun was tested last year—projectile 33 lbs.; rate of fire 14 rounds per minute; range 14,000 yards vertically and 20,000 yards horizontally; muzzle velocity 2,800 f.s. A new tripod has been designed for the ·50 calibre A.A. machine-gun, as the old one vibrated excessively. A further multiple mounting is under experiment to increase the rate of fire and rigidity. It is to be mounted on a trailer, with the computer and height-finder in the towing truck, so as to take its place in a mechanized column.

Sixty-inch barrel type searchlights are used, four lights at the points of a square about the battery, and 1,500 yards from the guns: a sound locator is paired with two of each four lights to direct the beams. The light is carried on a truck, with crew and telephone wire to connect up to battery: the engine of the truck drives the generator: the latest light uses 250 amperes, but this powerful beam will be used as a pilot to pick up the target, after which it will be handed on to the 150 ampere lights for shooting purposes. The sound locator has been improved and provided with a sound lag corrector, to correct for known variables in sound, and also an electrical device for connecting it up with the beam through an automatic computer. As the locator horn moves, the computor is actuated to provide corrected elevation and azimuth, and the light moves automatically on precise data. If this development succeeds, it is claimed that the hearing of the sound made by the target will enable the lights to illuminate it forthwith.

D.M.F.H.

TIDSKRIFT I FORTIFICATION.

THE JOURNAL OF THE SWEDISH ENGINEER TROOPS. 1928. PT. IV.

1. *The Engineers' Colours and Emblems.*

In 1925, H.M. the King ordered, upon the regrouping of regiments, that the question of colours should be revised by a committee of officers and heralds.

The Engineers, Flying Corps, and Train put forward to this committee a request for the issue of colours, which they had not previously borne.

The author then proceeds to discuss the emblems suitable for Engineers. He traces the growth of colours from the Roman standards, through the coat armour of knights, to the assumption of arms by countries and cities.

Eventually, he cites the use of heavy standards by foot soldiers, and light standards by mounted troops. He mentions the introduction of battle honours about 70 years ago. A short description follows of the ground colours allotted to Household troops, Cavalry, and Infantry.

In choosing an Engineer emblem, the choice of design was limited by the demands of heraldry, the necessity for conventional figures, and the correct heraldic application of colours.

A five-pointed star has long been used on maps to denote a fort. The surrounding of this star by a twelve-pointed star, indicating the outer fieldworks, makes the design more modern and still within heraldic conventions.

The pictures on p. 172 show an admirable grouping of this heraldic device with the arms of that part of the Triple kingdom (Svealand, Gotaland, and Norsland) to which the Engineer troops belong.

Svea ing.-kår.

Telegrafkåren.

E.E.R.

AN t-OGLACH—THE IRISH ARMY QUARTERLY.

VOL. I, NO. 3. JUNE, 1928.

Properly to appreciate the outlook of the Free State Army, two points must be borne in mind. First, the intense desire to make the Army (as everything else in the country), national in character and as unaffected by foreign influences as possible. In the second place, the position in which the authorities find themselves placed must be understood. Early in 1922, the process of transition from a Volunteer Force to a Regular Army was under consideration, but before any sound logical decisions as to the exact requirements of National Defence could be arrived at, the authorities were called upon to raise, train, and equip what came to be known as the " National Army," for the purpose of suppressing internal

disorder. It was not until well on in 1925 that any real constructive work could be undertaken.

These two points are reflected clearly in the number of *An t-Oglach* under review. There is, of course, the " padding " of general articles on military operations, organization and tactics (including a very clear and simple explanation of Liaison with Artillery during the Attack), and, very naturally, in the Editorial Notes mention is made of the participation of Colonel Fitzmaurice in the first East-to-West Trans-Atlantic flight. The editor emphasizes the necessity of seizing the opportunity of Ireland becoming the Eastern terminus of the future trans-Atlantic air routes. It appears to the reviewer that, in view of the disadvantages attending Ireland's comparative geographical isolation as an air terminus for such routes, more profitable lines for exploitation would lie in the direction of meeting sea-borne mails (and possibly passengers), and distributing them by air to Great Britain and to the Continent. But the real interest of the Army at the moment is undoubtedly, " What are we for, and how are we to train for it ? "

The outstanding contribution is Major-General MacNeill's introductory address, which was delivered last February on the occasion of the inauguration of the " programme of Study and Research conducted by the newly-formed ' Defence Plans Division.' "

The Defence Plans Division is a department of the General Staff—a temporary department—in which are gathered together officers of all branches of the Service, including some who have recently returned from military missions to Great Britain and the United States. The work of the Division is divided into two portions. Stage A will cover preliminary general duties, during which all officers will go through courses in Organization, Tactics, Command, Military History, Strategy, etc., rather, it is surmised, on the lines of the " crammer's " courses so well known to Staff College aspirants. It is interesting to note that the basis of these studies will be founded on the methods and doctrines of the United States Army.

Stage B, it is stated, will deal explicitly with the study and solution of Ireland's particular problems of National Defence, and the " formulation of an Irish Doctrine of War," which having been determined, " Tactical Doctrines for each Arm of the Service, commencing with the Infantry as the Basic arm," will be considered. These will be followed by the discussion of problems of Organization, Equipment, and Supply, all with special relation to the natural resources of the country.

It cannot be expected that the conclusions of the Defence Plans Division will be arrived at in a few weeks or a few months, but the final form which the Irish National Army will take and its methods of training will be of great interest to all students of Military Science. In our army, we are dealing with a weapon which has been long established, a weapon with ancient traditions, one in which many methods have been tried and discarded, or tried and retained. In the Free State, we shall see the process of forging a modern Army from what is practically the starting post.

S.

BULLETIN BELGE DES SCIENCES MILITAIRES.

(1928. TOME I.—NOS. 4 TO 6 INCLUSIVE.)

Les opérations de l'Armée belge. The account of the Battle of the Yser is continued in the three numbers of the *Bulletin* under notice; the events of October 29th to 31st, 1914, inclusive, being dealt with. A short account is given in No. 5 of the attack delivered by the Germans against the front of the Belgian 2nd Division during the night of October 29th–30th, in the early phase of which this Division was driven back from Ramscappelle. The French at once sent reinforcements to the Belgians, but in view of the difficulties existing on this part of the line, the French decided at midday to postpone further operations for the purpose of recovering the village named until later in the day. The advance of the French and Belgian troops was continued at 7 p.m., the signal for the assault against the enemy's position at Ramscappelle being given two hours later. The Franco-Belgian troops attempted to advance, but were held up at the Ramscappelleleed; in consequence, directions were given to discontinue the operations for the recapture of the village until the next day. Von Besseler, the Commander of the German III Reserve Army Corps, had intended to continue his offensive against the Belgian front on the 31st, but during the previous night he was obliged completely to modify his plans, owing to the success of the inundation operations carried out by the Belgian engineers (certain particulars relating to these inundation operations are given in all three numbers of the *Bulletin*). The operations on the portions of the front held by the B.E.F. and the French troops in Flanders are also briefly touched upon. October 31st, it is recognized, was one of the most critical days in the history of the B.E.F.: on that day, the British front between Zonnebeke and Messines—held by three infantry and three cavalry divisions and a small detachment of French troops—was violently attacked by 8 German Divisions; the troops on the left front of the British 1st Division were driven back at Gheluvelt, and at 2.40 p.m. the situation appeared to be so critical that a retirement, to a position within 2,000 to 3,000 yards from the outskirts of Ypres, was in contemplation by the Commander of the British I Corps; however, a counter-attack delivered by troops of the British 2nd Division fortunately restored the situation. During the evening, the British line was drawn back to the westward of Gheluvelt.

The operations in connection with the Battle of the Yser (October 18th–31st) are briefly summarized in No. 6, and a synoptic chart in relation thereto is also furnished. The losses sustained by the Belgians during this period were extremely heavy, and the strength of their formations was reduced to about two-fifths, on the basis of their normal establishment; details of the actual strength of the several Belgian cavalry and infantry divisions as at October 31st are given.

Du rôle de l'armée de campagne and des fortresses belges en 1914. Parts 2 to 4 inclusive of the contribution by Lieut.-Colonel Duvivier and Major Herbiet are given in the three numbers of the *Bulletin*. Part 2 (in No. 4) contains an interesting historical review of the basis on which the defensive positions on the Belgian eastern frontier and at Antwerp were

provided. The initial phase of the Great War is also touched upon in No. 4 of the *Bulletin*. On August 2nd, 1914, when the German ultimatum was received at Brussels, steps had only recently been taken to bring about a reorganization of the Belgian Army; a brief account is given of the condition of the Belgian field army and the fortresses at this date.

The mobilization and concentration of the Belgian Army at the outbreak of the War and the Defence of Liège are dealt with in Part 3 of the article. German sources of information have been used in compiling the story of the events at Liège.

In Part 4 an account is given of the position taken up by the Belgian Army on the Gette, and of its retirement to the retrenched camp of Antwerp. Particulars are also given of the defence of Namur, and of the successful retreat into French territory of the Belgian troops from their defensive position on the Meuse through the narrow gap which existed on August 23rd between the German II and III Armies immediately south of the western forts of Namur. The Belgians, having reached the shelter of the French V Army, were conveyed without delay by rail and sea to Ostend and Zeebrugge.

Les Chars de combat. Parts 4 and 5 of the article by Major Liévin under this title are published in Nos. 4 and 5 respectively of the *Bulletin*. Matters affecting the armament of tanks and their crews; anti-tank weapons and conning arrangements are discussed in Part 4. The requirements in relation to light and medium tanks are dealt with in Part 5, and details are also given therein of some of the machines actually in use or under experiment on the Continent at the present day. Both parts are illustrated with photographic reproductions and sketches.

Napoléon 1er.—Sa vie et son œuvre. Part 2 of the article by Major F. Delvaux under this title is published in No. 4; it deals with the activities and work of Napoleon during the period of his First Consulship.

La marche à la bataille. Colonel Hans, of the Belgian General Staff, discusses in No. 5 matters affecting march discipline, advance guards, and supply columns, as affected by recent developments in armaments and by the progress in mechanization.

L'organisation de l'Armée tchécoslovaque. An outline of the organization of the Czecho-Slovakian Army is contained in No. 6 of the *Bulletin*. Military service is compulsory in Czecho-Slovakia, the physically and mentally unfit citizens being alone exempted from liability to serve. The Minister for National Defence determines each year the quota to be called up for enrolment and training. The army comprises 167 infantry battalions, including 1 tank battalion; 306 batteries of artillery; 63 squadrons of cavalry, including 3 of cyclists; 18 aviation squadrons; and 20 engineer battalions. The Engineer Arm is organized in 6 regiments, and 3 signal battalions of 3 to 5 companies—12 companies in all. Five of the regiments comprise 12 engineer battalions, 1 mountain battalion, 1 bridging battalion (5 service and 1 reserve company), and 1 mechanical battalion; the remaining regiment consists of 2 railway battalions.

Les délibérations de la Commission mixte. La couverture permanente de la frontière. The *Commission mixte*, appointed to enquire into the

defence system of Belgium and matters affecting the organization of the Belgian Army, issued an *Ordre du jour* on April 3rd last. An article under the foregoing title is contributed anonymously to No. 6, and discusses some of the conclusions of the *Commission mixte*. After stating that it was impossible, under the present conditions of national defence, to provide for the immediate reduction in the period of active service in the Army as now established by law, the Commission proceeds to make certain recommendations as to the steps which should be taken to allow the necessary reforms to be carried out for the purpose of reducing the personal burdens in respect of military service. The first of these recommendations is that a scheme should be worked out as early as possible for the purpose of ensuring the permanent protection of the Belgian frontiers. An interesting analysis is made in the article now under review of the manner in which the problems, presented by the various forms of attack which may have to be met, might be solved by the Belgian General Staff.

W.A.J.O'M.

JOURNAL OF THE SOCIETY OF ARMY HISTORICAL RESEARCH, JULY, 1928.

Royal Engineers in British Columbia.

Under *Notes, Questions, and Replies* is given an extract from "Rambling Recollections," by the Rt. Hon. Sir Henry Drummond Wolff, published in London in 1908, which is quoted in full below :—

"The period (1858) was also one of interest owing to the foundation of British Columbia. An expedition of Royal Engineers was organized to go there. On their embarkation Sir Edward Lytton* made a speech, which has never till now been published, and which, to my mind, was one of the best he ever delivered :—

> Soldiers! I have just come to say to you a few kind words of parting.
>
> You are going to a distant country, not, I trust, to fight against men, but to conquer nature; not to besiege cities, but to create them; not to overthrow kingdoms, but to assist in establishing new communities under the sceptre of your own Queen.
>
> For these noble objects, you, Soldiers of the Royal Engineers, have been specially selected from the ranks of Her Majesty's armies. Wherever you go, you carry with you not only English valour and English loyalty, but English intelligence and English skill. Wherever a difficulty is to be encountered, which requires in the soldier not only courage and discipline, but education and science, Sappers and Miners, the Sovereign of England turns with confidence to you. If this were a service of danger and bloodshed, I know that on every field, and against all odds, the honour of the English arms would be safe from a stain in your hands; but in that distant region to which you depart, I hope that our national flag will wave in peaceful

* Edward George Earle Lytton Bulwer-Lytton, Bart., Secretary of State for the Colonies.

triumph on many a Royal birthday from walls and church-towers which you will have assisted to raise from the wilderness, and will leave to remote generations as the bloodless trophies of your renown.

Soldiers! you will be exposed to temptation. You go where gold is discovered—where avarice inflames all the passions. But I know that the voice of Duty and the love of honour will keep you true to your officers and worthy of the trust which your Sovereign places in her Royal Engineers.

On my part, as one of the Queen's Ministers, I promise that all which can conduce to your comfort, and fairly reward your labours, shall be thoughtfully considered. You have heard from my distinguished friend, your commanding officer, that every man amongst you who shall have served six years in British Columbia, and receives at the end of that time a certificate of good conduct, will be entitled —if he desire to become a resident in the Colony—to 30 acres of land, aye, and of fertile land, in that soil which you will have assisted to bring into settlement and cultivation.

In the strange and wild district to which you are bound, you will meet with men of all countries, of all characters and kinds. You will aid in preserving peace and order, not by your numbers, not by mere force, but by the respect which is due to the arms of England, and the spectacle of your own discipline and good conduct. You will carefully refrain from quarrel and brawl. You will scorn, I am sure, the vice which degrades God's rational creature to the level of the brute—I mean the vice of intoxication. I am told that is the vice which most tempts common soldiers. I hope not, but am sure it is the vice which least tempts thoughtful, intelligent, successful men. You are not common soldiers—you are to be the pioneers of civilization.

Nothing more counteracts the taste for drink than the taste for instruction. And Colonel Moody will endeavour to form for your amusement and profit, in hours of relaxation, a suitable collection of books. I beg to offer my contribution to that object, and I offer it, not as a public Minister, out of public monies, but in my private capacity as a lover of literature myself, and your friend and well-wisher.

Farewell! Heaven speed and prosper you! The enterprise before you is indeed glorious. Ages hence, industry and commerce will crowd the road that you will have made; travellers from all nations will halt on the bridges you will have first flung over solitary rivers, and gaze on gardens and cornfields that you will have first carved from the wilderness. Christian races will dwell in the cities, of which you will map the sites and lay the foundations. You go not as the enemies, but as the benefactors of the land you visit, and children unborn will, I believe, bless the hour when Queen Victoria sent forth her Sappers and Miners to found a second England on the shores of the Pacific.

Articles in this number of the *Journal* are: "The Diary of Lieut. John Barker" (concluded 1776); "The Death of Major-General James

Wolfe " ; " The Colours of the British Marching Regiments " ; " The Order of Shotinge Wt the Crosbow " (a poem of the 16th century) ; " The Graves of British Soldiers at Concord, Massachusetts, U.S.A."

With this number is enclosed a slip giving an account of the Sixth Annual General Meeting of the Society. The President, Sir W. Hastings Anderson, suggested various ways of making the *Journal* better known ; *inter alia*, that specimen copies of the *Journal* might be sent to Serjeants' Messes, and also to Allied Regiments in the Dominions.

References to the founding of Sapperton and to other works done by the Sappers in the development of British Columbia will be found in the *R.E. Journal*, December, 1924, *The Supplement to the R.E. Journal*, September, 1922, October, 1927, and February, 1928.

P.H.K.

REVUE MILITAIRE SUISSE.

(1928. NOS. 1 TO 6 INCLUSIVE.)

Du commandement. The article under this title appears in Nos. 1 and 2 ; it is contributed by Lieut.-Colonel Combe, who analyses therein some of the chapters devoted to the subject of " command " in Part 3 of the recently-issued Swiss Field Service Manual (*Instruction sur le Service en Campagne*, 1927). The first part of the article contains observations on the sections of the Manual which deal with the essential elements to be taken into consideration by a Commander for the purpose of arriving at a decision in relation to the employment of his troops whilst on field service ; the framing of orders ; and the place of the Commander during the progress of operations. The second part of the article deals with the sections of the Manual devoted to matters affecting the General Staff and the staffs of an infantry brigade, an infantry regiment, and a battalion.

La défense française en Haute-Alsace et l'occupation du Porrentruy en 1915–1916. This article appears in No. 2 ; it is an extract from the *Sous-Officier* (1927, Nos. 10 and 11), the Journal of the *Société fédérale de Sous-Officiers (Section de Genève)*. Lieut.-Colonel P. Martin is the author of the original, and suggests in his article that the mobilization of the Swiss Army during the Great War, and the fact that it occupied the Porrentruy salient, had a considerable moral effect on the belligerents ; to the action taken by the Swiss Government to hold the Swiss Army ready for immediate active employment against any invader was it largely due, Colonel Martin thinks, that the belligerents respected the neutrality of Switzerland, and the Swiss people were spared the burdens and terrors of a foreign occupation of their country.

Le matériel de l'aviation militaire. The original article appears in No. 2 of the *Revue* and is contributed by Lieut. E. Naef, who refers briefly to the fact that steps are being taken to effect a reorganization of the Swiss Air Force during the current year ; he also calls attention to the types of aeroplanes in use in certain of the European countries, and discusses their characteristics.

Le service en campagne. An article under this title appears in Nos. 3 and 4 of the *Revue* ; it is contributed by Captain Montfort, who discusses

therein the subject of outposts in the light of the instructions contained in the recently-issued Swiss Field Service Manual mentioned earlier in this notice.

La Suisse désarmée. The original article appears in No. 3 of the *Revue*; it contains an able and telling reply from Colonel F. Feyler to the Swiss pacifists, who are carrying on a campaign for the complete disarmament of Switzerland.

La contre-attaque. The original article under this title is contributed by Colonel Verrey and appears in Nos. 5 and 6 of the *Revue*. Colonel Verrey treats his subject in the light of the recently issued Swiss Field Service Manual; in the first part of the article he points out that the new Swiss regulations recognize two types of counter-stroke, known distinctively as the *contre-assaut* and the *contre-attaque*—the official definitions of these two types are quoted in the original article. The former term is applied to the type of counter-stroke which aims at thrusting back an enemy before he has had time to reorganize and establish himself in the position gained sufficiently long to receive reinforcements, *i.e.*, it is an attack launched without loss of time for regaining a definite objective. The latter term is applied to a deliberate attack, planned to take place with a considerable body of troops effectively supported by artillery and machine-gun fire.

Colonel Verrey draws attention to the fact that similar distinctions in relation to the character of counter-strokes are made in the latest French and German regulations; the French have named the two types *contre-attaque immediate* and *contre-attaque d'ensemble*, whilst the Germans speak of them as the *Gegenstoss* and the *Gegenangriff*.

Historical examples of both types of counter-stroke drawn from the Waterloo Campaign, the Franco-German War, and the Great War, are given and discussed.

W.A.J.O'M.

REVUE MILITAIRE FRANÇAISE.

(*July*, 1928).—In the third instalment of "*La bataille de l'Avre*," Commandant d'Argenlieu describes the operations of Général Débéney's First Army in the area west of Montdidier at the end of March, 1918. The most interesting point is that the Army Commander wrote in an order:—"If circumstances become so serious that a choice must be made between liaison with the French or with the British, the First Army will then maintain liaison with the French."

Lieutenant-Colonel Paquet completes "*La défense du Bois de Ville et de l'Herbebois*" in this number. The story is a typical one of trench fighting, and finishes with the success of the German troops, in their onslaught on Verdun in 1916, in capturing these two places after a heroic defence by the French. The article is really only of special interest to those who took part in the action or who know the country.

Général Camon continues "*Autour des batailles de Napoléon*" in this number. He deals with Napoleon's method of attacking his enemy from such a direction as to cut him off from his line of retreat. The two examples given are Friedland and Waterloo. At the former battle,

the Russians were deployed with the R. Alle behind them, and Napoleon directed his attack so as to cut them off from the few bridges by which they could retreat. At Waterloo, he proposed to break through Wellington's left so as to seize the only line of retreat, the Brussels road through the Forest of Soignes. We all know how Napoleon was foiled by the bravery of Wellington's British and Dutch troops, and by the arrival of the Prussians.

Colonel Bailly begins "*Franchissement des fleuves en présence de l'ennemi*" in this number. He quotes Frederick the Great and Napoleon, the former stating that cunning is necessary to cross a defended river, while the latter wrote that it is practically impossible to defend a river line against an attack on a wide front. The writer then discusses three examples from the Napoleonic wars to show that big rivers, like the Rhine and Danube, can be crossed provided that the cunning laid down by Frederick the Great is shown. In the next number he proposes to apply the old methods to more modern conditions.

In "*La réforme de la justice militaire*," Capitaine Andrieux describes the law passed in France since the War dealing with military justice. The object of the law was partly to place military justice on a footing in which it is in no way subservient to the military command, but at the same time little or no more indulgence was shown to the military criminal.

(*August*, 1928).—The fourth instalment of Commandant d'Argenlieu's "*La bataille de l'Avre*" continues the story of the German advance at the end of March, 1918. More than one French counter-attack could not be carried out owing to the pressure of the German onslaught, but the First Army still succeeded in keeping contact with the British.

Général Camon concludes "*Autour des batailles de Napoléon*" in this number. He describes, chiefly from Napoleon's own reports, the battles of Austerlitz and Wagram. At Austerlitz, he succeeded in drawing on the Russians to attack him, and then shattered them with the famous flank attack. At Wagram, where his troops were not so seasoned, he dared not allow the Austrians so much freedom, but the idea of the battle was the same. Général Camon concludes by pointing out how different was Napoleon's idea of the offensive compared with that which imbued the French Army before the Great War. Attacking the enemy in flank is not the same as continuous attacks "pour prendre la gorge" as had been taught in France since 1870.

Colonel Bailly, in the second instalment of "*Franchissement des fleuves en présence de l'ennemi*," discusses the possibility of opposed river crossings in modern warfare. He points out how modern equipment favours the defence, on account especially of the increased range of guns and of mechanical transport for moving reserves. From this he draws the conclusion that, in crossing a big river held over a long front (obviously the Rhine is being considered), a determined attack must be made all along the front, so as to pin down the enemy's reserves. This may mean terrible losses, but only by this method can a crossing of this kind be effected.

"*Souvenirs militaires sur la révolution française*," by Capitaine Andriot, is only of historical interest. A recent exhibition of the French revolu

tion brings to light a number of papers concerning the military operations of the revolution, especially before the advent of Napoleon.

Lieutenant-Colonel Bru and Commandant Cortot begin "*Étude sur les opérations offensives entreprises pour la conquête et le nettoyage de la Ghouta*" in this number. The Ghouta was the stronghold of the Syrian rebels at Damascus in 1926, and operations had to be undertaken to destroy them. Owing to the area being thickly overgrown by vegetation, the operation was most difficult. Several columns were sent out to converge on the area from different directions, while other detachments barred the possible exits. After much severe fighting, in which the rebels acquitted themselves very well, the French were successful in beating them, but with considerable losses. Practically all the fighting was done by tanks and infantry, other arms proving of little value. In the next instalment, the writers propose to discuss the cleaning up of the area after the original battle.

(*September*, 1928.)—Commandant d'Argenlieu continues "*La bataille de l'Avre*" in this number. The final stages consisted of numerous attacks and counter-attacks, together with small German advances, but by the beginning of April the First Army front was stabilized just west of R. Avre. A point of interest to us is a brilliant charge by a brigade of Canadian cavalry just north of Morcuil on 30th March. Although the cavalry suffered very heavily, they succeeded in re-establishing the situation here, after a hole in the line had been formed by the retreat of the infantry.

Médecin-Général Uzac begins "*De l'ancien au nouveau règlement du service de santé*" in this number. Apparently the French medical arrangements in 1914 were terribly inadequate. The battles of Charleroi and Guise, to refer only to the 5th Army, produced appalling scenes on the railways. There were no proper ambulance trains arranged and the unfortunate wounded collected on any empty trains going back. It took a long time, during the trench warfare period, to build up an efficient system; but, by the end of the War, an organization, by which the wounded were properly dealt with, had been established.

In completing "*Franchissement des fleuves en présence de l'ennemi*," Colonel Bailly describes various successful river crossings carried out during the Great War. Unfortunately, most of these crossings were effected by the Germans against the Russians, who could not be regarded as up-to-date enemies. The Germans, however, achieved a remarkable success in July, 1918, when they crossed the Marne; but, again, the example is not a good one, as the Marne is not a big enough river. The writer sums up by pointing out what the attacker requires. Provided that he has the material, attacks on a wide enough front, and is able to blind both the enemy's weapons and the position of his bridges with smoke, Colonel Bailly considers that a general can always undertake a river crossing with every chance of success. This last instalment is the most interesting of the series and is well worth attention.

Lieutenant-Colonel Bru and Commandant Cortot complete their interesting article, "*Étude sur les opérations offensives entreprises pour la conquête et le nettoyage de la Ghouta*," in this number. The area was satisfactorily cleaned up and immediately the life of Damascus returned

to normal. In reading the writer's conclusions, it is interesting to see how the principles of war crop up in all kinds of operations. In this one, careful preparation by the Command, combined with absolute surprise, were the bedrock of the French success.

"*Le corps des officiers d'administration et service d'État-Major et de recrutement*," by Officier d'administration Sanguinède, refers to the abolition of this clerical corps of officers in France after a duration of less than fifty years. The problem does not affect the British Army, which has no corps of this type. The writer points out the advantages gained by having this corps to look after the documents of the different staff offices and deplores the present necessity for its abolition.

H.A.J.P.

HEERESTECHNIK.

(*January*, 1928).

A Scientific Anniversary. At Tübingen University in 1883, Carl Cranz, student of mathematics and mechanics, was given as thesis for his doctor's degree " A theoretical investigation of the regular deviations of projectiles and of the best shape of rifling." His subsequent friendship with two directors of the great firm of rifle-makers, Mauser, confirmed in him the interest thus awakened in ballistics, and, during his twenty years' professorship at the Stuttgart Technical School, he founded a laboratory for ballistics and published three works on the subject : *Synthetic-geometrical Theory of Curves and Curved Surfaces, Theoretical Studies in the Ballistics of Rifled Weapons*, and *A Compendium of Theoretical External Ballistics*. By this time, Cranz's work was well known to the Gun-proving Commission, which had frequently asked him to undertake investigations on their behalf, and had also sent officers to take part in his laboratory trials. In 1904, he was selected as Professor of Ballistics at the Military Technical Academy, and also as Superintendent of the Government Ballistic Laboratory, which he was called upon to start. In a few years, he made this latter a model establishment for experimental ballistic research of world repute. Many of his publications henceforward took on a new character. Such are :— *The use of electrical instantaneous photographs for investigating the behaviour of firearms, A photographic method of measuring velocities and decreases in the velocity of bullets, The use of cinematography for investigating explosion-phenomena*, and *The use of D.C. Quenched Spark-gaps for cinematographic photography of projectiles.*

His knowledge and wide experience were of the greatest use to his country throughout the War, and he produced shooting tables of all sorts, from mountain and anti-aircraft artillery to trench-mortars, working indefatigably the while in order to improve the work and teaching of the Military Technical Academy when peace should come. The Treaty of Versailles, however, closed the M.T.A., together with other institutions which were considered as dangerous to Germany's foes, and Cranz's activities were transferred to a fresh field, the Professorship of Physics at the Berlin Technical High School.

The leading German military scientific journal does credit to itself in

thus honouring a civilian who has given 45 years of his life to the study of ballistics—and the more so for the thoughtfulness of publishing such an article while its subject was still alive to appreciate it.

Weather and the course of weather-changes, by Dr. Kölzer. The general run of articles on the weather may be classified as "Hazy, with bright intervals." Dr. Kölzer's article is no exception to this, but at least he explains the haziness to us. He starts brightly enough, to the effect that meteorology has in recent years undergone a change, in that the state of the weather is now looked upon as a result of the movement of air-currents, rather than as a result of changes in atmospheric pressure. In support of this statement he cites:—Schmidt, *The interaction of vapour-masses in the open air*, 1925, published by Grand, Hamburg; Hann-Süring, *Manual of Meteorology*, 1926, and Süring, *Guide to Meteorology*, 1927, both published by Tauchnitz, Leipsic.

The author admits that the daily weather-charts do not as yet give expression to this change with uniformity, many districts in Germany keeping to the old system. Further, he thinks that the system of weather-prediction by means of pressure-changes will long hold the field. "It is characteristic of the weather that it is the condition of the moment, brought about by the combined effect of all the meteorological elements. Unfortunately, not even the experts can agree as to what these elements are, and in some text-books they are mentioned without being defined." The author gives as his own list of the more important elements: radiation received from the sun, and re-radiation from the earth (measured generally by the temperature of the air close to the ground): atmospheric-pressure: humidity of the air: the amount of cloud present (including ground-mist): rainfall (including other forms of moisture): and finally, the wind.

After his initial comparison, it is disappointing to find that he could not make up his mind to give the wind higher than sixth place. Nevertheless he says "the movement of highs and lows is both as regards direction and time quite irregular, and depends upon very many factors, of which many escape direct observation and measurement. One is hence, even to-day and in spite of all progress of meteorological science, when deciding beforehand the probable positions of high and low pressure centres in the immediate future, really thrown back upon experience. This task forms the chief problem of weather forecasts. The changes in the weather in dependence on the position of high and low pressure areas do not make themselves felt by us through air-pressure, but in the first place by the wind. The origin of air-currents determines the temperature and humidity of the approaching air-masses, and with them also the weather of the place of observation." Then he hedges once more. "Consequently, the wind must also be looked upon as carrier of weather-changes."

The necessary warning closes the article, that as all the factors are not known, weather-predictions can be made only with a greater or less degree of probability.

How does one fight tank-targets, and with what effect? Major Justrow doubts whether, between armies of equal strength, any very great importance is now to be attached to the tank, since the moment of surprise is past (? surprise of their *first* appearance), constructional details are

pretty generally known, and anti-tank defence has been arranged accordingly. The fact that the tank is still a dangerous opponent for the Germans proves nothing to the contrary, for to a party not permitted to arm, any man with a stout stick can be fatal.

He then considers the questions of vulnerability, of weapons, projectiles, and penetration, and, on the plea that obstacles, mines, and tank-traps will be of very limited application in mobile warfare, confines himself to the side of the question which (besides the tank-troops themselves) concerns infantry and artillery, but not the engineer.

The Madsen Machine-gun. Notes taken from an article in the *Militaert Tidskrift*, by Capt. Jessen, of the Danish General Staff. This gun, designed by Major-Gen. Madsen in 1891, became part of the equipment of the Danish cavalry in 1903, has now been introduced into the armies of twenty different countries, and is still being produced in ever increasing numbers.

As the heavy m.g. is unknown in the Danish army, Capt. Jessen proposes to put the light Madsen on a carriage. This is a possible solution for any country which wishes to introduce heavy m.g's, but cannot face the expense of separate m.g. troops. The great advantages would be having a single type of m.g., ammunition of one calibre, complete uniformity of equipment, training, and supply.

The carriages would be company equipment, so that the company commander can change all or any of his 18 light machine-guns into heavy, as he finds desirable.

Capt. Jessen suggests that his types of light carriage are suitable even for armies already armed with a heavy m.g. They would permit of the use of the battalion heavy m.g's by battalion commanders, unrestricted by the clamour of company commanders.

Tables compare the dispersion at 200 metres and at 400 metres with Colt, Vickers, and Hotchkiss greatly in favour of the Madsen on light carriage.

One type of carriage weighs 9·3 kilos, and has a maximum height at butt of 67 cm.; another 12 kilos and 80 cm. Photographs show the gun on light carriage firing over a parapet, with butt at 36 cm., at 67, and at 80, for indirect fire, in action against aeroplanes (for which the heavier type has an arrangement of 360° traverse), and carried on the back on the line of march.

(*February.*)—*The great German Wireless Exhibition, 1927.* Wireless exhibitions in general run true to type. In accordance with the development of science and of industry, the centre of public interest shifts from year to year (in 1926, broadcasting receivers: in 1927, loud-speakers and arrangements for connecting with light-mains), but the exhibition itself remains a place where exhibitors (300 in this case) vie in showing the public their latest productions, and bidding for its favour by the ingenuity, simplicity, novelty and attractiveness of their exhibits. The value of a fair of this kind to the development of military wireless is, therefore, both limited and indirect.

Two points of general interest are that A.C. valves, already established abroad, made their first appearance on the German market at this

exhibition, and that amongst the exhibitors was the German Post Office, not only with interesting historical exhibits, but also with a Carolus-Telefunken picture-telegraphy set, accepting photographs and hand-writing for dispatch, and thus doing some useful advertising.

Points in Vehicle-construction, by Major Giesecke. These notes deal with the subject on elementary lines, the wheel and axle, tilted and conical axles, axle-friction, and ground-friction, driving uphill, turning, high *v.* low wheels, breadth of felloe, and tilt of spokes.

The following averages are given for surface-resistance, compared with load=1,000 :—

Loose sand, 150 : soft earth or unrolled metal, 100 : dry, firm earth or muddy metalled road, 50 : uneven stone paving, 40 : dry, well metalled road, 33 : good stone paving, 20 : wood paving, 13 : asphalte, 10.

As regards felloe-breadth, a law in Prussia permits four-wheeled vehicles having :—

5 to 6½ cm.	felloe-breadth	to	carry	2	tons.
6½ to 10 cm.	,,	,,	,,	2½	tons.
10 to 15 cm.	,,	,,	,,	5	tons.
Over 15 cm.	,,	,,	,,	7½	tons.

Which figures show how much the authorities encourage broader wheels.

Recommendation is made of slightly conical axles with a very small degree of tilt, and wheels having the same small degree of tilt of their spokes.

How does one fight tank-targets, and with what effect? (continued). Major Justrow deals with tank penetration by artillery. As regards the use of gas-shell against tanks, he considers gas altogether unsuitable for use against tanks, which are not only capable of being rendered gas-tight, but which can travel quickly through the infected area. In any case, each of the crew can carry his own protection. Further, ordinary gas-shell is too weak to penetrate, while armour-piercing gas-shell with delay-action fuze would be as devastating against tanks as ordinary armour-piercing shell, but not more so to any extent which would justify the additional complications of fuze, bursting-charge, and gas-filling.

The author complains that while, on the subject of construction, armament, weights and speeds, much good sense has been written, especially in Major Heigl's publications, one will seek in vain in tank-literature a clear and exhaustive answer to the difficult question, " What firearm is the most effective in destroying tanks? " The infantry-rifle is unequal to the task. A rifle should be of 12 to 15 mm. calibre and have a muzzle-velocity of at least 650 metres a second to be effective even against light tanks, and then it ceases to be an ordinary rifle. The critical calibre at which one passes from rifle to gun using the simplest form of explosive bullet is ·8". Such a weapon will be ineffective against heavy tanks unless its muzzle-velocity is over 1000 m. per sec., when we get a weapon liable to become out of order very easily when firing rapidly, of very short life, and quite unsuitable for mass-issue.

If a special anti-tank weapon is built, it must be effective against heavy

tanks. The infantry-soldier cannot know beforehand what kind of tank is going to attack him, nor can he measure the armour of the attacking tank, so as to use against it only the appropriate weapon. He will, however, immediately discover whether the weapon he is using is effective or not, and, if the latter is the case, with disastrous results. Of what use is an anti-tank gun if its issue is limited?

Major Justrow hopes by writing in this manner to stir up a profitable discussion.

Fuel cares in France. The task of ensuring the provision of the fuel necessary for the compulsory mechanization of the army is an extraordinary source of anxiety to the French Government, and to the French military authorities. France itself possesses only small resources of oil in the mother country (chiefly at Pechelbron in Alsace), and apparently none in her colonies. This dependence upon the oil-production of foreign countries has led to great attempts, officially supported in every way, to provide at least for lorries to be gas-driven, and also for the use of alcohol, natural and synthetic. These efforts are alleged to have been successful. Whether more was hoped for, or whether the actual needs in case of war have been estimated at a very high figure, the fact remains that France is making extraordinary exertions to obtain as large a share as possible of the world's oil-production. Further, oil-importers are compelled under strict supervision to stock at least three months' supply at their previous year's rate of issue. A state-monopoly of oil has also been proposed in the Chamber, and a petroleum-commission of 44 members appointed to go into the question.

Independence of possible enemy countries is sought in two ways:—

(1) Arrangements with countries like Russia, Roumania, etc., which are wholly or partially independent of the English and American money-magnates; and agreements with import companies independent of the English and American trusts.

(2) Getting a share of the produce of oil-fields about to be opened up, as was the case in April, 1920, when the German share of the Turkish Petroleum Co.'s workings in Mesopotamia was allotted to France.

"The ruthless energy with which France thus strives to secure this, as all other factors of her supremacy in Europe, is worthy of admiration."

The Madsen Machine-gun (concluded). Photograph and figures are given of the new 20 mm. Madsen Gun, a normal Madsen m.g. on a larger scale, and intended as anti-tank weapon and for use against low-flying (up to 3,000 metres) aeroplanes; against armoured-cars, targets behind parapets, m.g. nests and infantry-guns within the range at which the strike of the bullets can be clearly observed; weight of gun, 53 kg., of carriage, 40 kg.; rate of fire, 200 rounds per minute; number of rounds in magazine, 15; maximum range, 6,000 metres; weight of bullet, 140 g. or 165 g.; muzzle-velocity, 750 metres per sec., or 675.

Capt. Jessen considers that every battalion should have six of these guns, while it appears still uncertain whether the 20 mm. Madsen can take the place of an infantry-gun. At the same time he recommends 4 light trench-mortars per battalion. The advantages of having light

and heavy m.g. the same, differing only in that the latter has a carriage, and of having an anti-tank gun in the battalion of the same construction as the m.g. and differing only in size, are manifest.

Photographs are also shown of the Madsen m.g. for use in aeroplanes, a fixed pair for the pilot, and a pair on a ring-mounting for the observer.

(*March.*)—*Points in Vehicle-Construction*, by Major Giesecke (*concluded*). This month's instalment goes more fully into the details of the wheels, wooden *v.* metal naves, spokes, felloes, axle, bearings, and also deals with draught, the pole, and the best size of wagon. From the principles laid down, a 25 to 30 cwt. wagon should be designed as follows:

(1) Own weight as light as possible, *i.e.*, not over 10 cwt., so hard wood should be confined to the firm structure of the wagon, and to parts concerned in carrying the load: the use of steel and iron parts limited to axles, tires, naves, and the indispensable fastenings: a suitable relationship between axle and wheel-box: axle, say, $1\frac{3}{4}$″ diameter.

(2) Tilt of axle and of wheel as small as possible; $\frac{3}{8}$″ and 2″ respectively will be sufficient.

(3) High wheels: when of different sizes, front 3′ 6″, back 4′ 0″: when of same size, 4′ 0″. On account of overturning moment increasing, larger sizes are undesirable.

(4) Tires not too narrow, say $2\frac{1}{2}$″ broad.

(5) Metal naves whenever possible. Roller-bearings would be considered only for wagons larger than 25 to 30 cwt.

(6) Wide track: 5′ is considered normal, and was laid down by the Standards Committee.

(7) A broad wagon-body, not too high (not over 25″), for taking bulky goods when necessary, also for ease in loading and for stability.

(8) Wagon-body as short as possible, for the best distribution of the load.

The Perfect Screw. This article shows that, whether the screw is used as fastener or for transmission of motion, the essential part of the relationship between male and female screw consists, not in their touching in all points of their respective surfaces, but in their relative movement.

If every point of the two screw-surfaces had to touch, male and female screw would have to be alike in seven separate measurements. In order, however, to prevent the bearing of the thread exclusively on its edge, and in order to facilitate manufacture, a certain amount of play is allowed both within and without. Thus, perfect equality is not aimed at in four of the seven measurements. The remaining three are the thickness of the thread at its base, the angle included between the two sides of the thread, and its height.

Diagrams show the effect, the other two dimensions being correct, of divergences in the size of the angle, and in the height of the thread. Whether these are too great or too small, the four pictures show that the result is the same. The distance between the flanks has to be reduced. Now, this should by all means be avoided, since it reduces the length of the flanks and thus the common bearing-surface of the male

and female screws, which, as it transmits the energy, should be as large as possible.

The same faults occurring in the female screw have the opposite effects. In all four cases, the distance apart of the flanks would have to be increased.

Hence, to allow for possible deviations in height of thread and in the angle of flanks, a minus-allowance has to be made in the thickness of the thread at its base, and a plus-allowance in the corresponding measurement of the female screw.

Such an arrangement, instead of being "sticky," has plenty of play, but it can nevertheless provide the perfect screw, since the maximum bearing-surfaces touch each other and wear little by turning under pressure.

How does one fight tank-targets, and with what effect? (*concluded*). In Major Justrow's opinion, the anti-tank weapons worthy of serious consideration start at about 3·7 cm. (1½") calibre, the smallest size which is capable of providing the requisites—a strong enough armoured case, a safe delay-action fuze, a sufficiently large bursting charge, and a long-burning tracer. They must be capable of penetrating heavy tanks, but not the heaviest. The latter, on account of their enormous cost and of transport difficulties, will play no great *rôle* in the future, so that their appearance in masses need not be taken into account, and they may safely be left to the engineers to deal with, and to the medium and heavy artillery. This is an important consideration, since, if the anti-tank gun has to be capable of dealing with the heaviest tanks, its calibre must be increased, which means an increase of total weight, a decrease of handiness, while camouflage and especially ammunition-supply become more difficult. The upper limit is thus set at 5 cm. (say 2").

The larger calibres, especially of field-guns, 7·5 to 10·5 cm., are, of course, suitable for fighting tanks, but they do so only as a side-show, taking part in anti-tank defence when a target offers. In any case, they need special ammunition, at least a shell with an armoured head and internal or base-fuze, since ordinary explosive shell with sensitive fuze can achieve very little against good armour-plate over ¾" thick.

The author then joins issue with the writer of an article in the *Artilleristische Rundschau* on two points. He denies that large shell-splinters can certainly put tanks out of action, maintaining that a direct hit is necessary: and he denies that indirect fire with bracketing is a possible method of fighting tanks, being convinced that rapid-moving tanks can be dealt with only over the sights, and that the other method is a waste of special ammunition, which should be reserved until it can be employed with certainty of success.

In conclusion, after likening the tank to the battleship, to which the submarine is an answer, Major Justrow "does not consider technically impossible" a subterranean tank eating its way through the earth into the enemy's lines, where it would suddenly pop up! Then, as if he had sufficiently made his readers' flesh creep, he ends on the gentle note, that the party which concentrates its attention more on tank-defence than on tank-construction, will in his opinion reap the advantage in the long run.

The limit of use of gas-masks with chemical filters. Reproduced from *Draeger-Hefte*, Luebeck. The question is so often asked—after some unfortunate occurrence—as to the limit of use of gas-masks with chemical filters, that it is necessary to answer it very clearly. There are two kinds of gas-protection equipment—(1) those either producing chemically their own supply of oxygen, or having it stored up in a small steel cylinder; (2) those which do not provide oxygen, so that the wearer is dependent for the oxygen he needs upon the surrounding air.

All gas-masks with chemical filters belong to the latter group. To the wearer of the former kind of mask, the composition of the surrounding air is a matter of indifference; to the wearer of a mask with chemical filter, it is of vital importance. Lack of oxygen arises either through oxygen consumption in combustion or through oxygen being crowded out by poison-gas. In the former case, CO^2 will be present, and perhaps even CO, and the use of the oxygen gas-mask is clearly indicated. In the latter case, matters are more complicated. From ·75 to 1% of poison-gas is a high degree of concentration, and in such concentrations the small filters in general use will have a low limit of service, even if the oxygen supply is ample. If there is reason to suppose a higher degree of concentration of poison-gas, a larger filter must be used.

Even when capable of dealing with the proportion of poison-gas present, no chemical filter is safe unless there is 15% of oxygen in the surrounding air (out of the normal 21%). If the percentage of oxygen sinks to 12, death from suffocation can ensue, while the filter is performing its office with perfect success.

When an accident happens, the newspapers are inclined to lay the blame on the gas-protection equipment, whereas generally the fault can be traced back to a lack of knowledge of the gas-conditions. In some instances it has transpired that these conditions had not even been considered. "Forewarned is fore-armed!"

F.A.I.

MILITARWISSENSCHAFTLICHE MITTEILUNGEN.

(January–February, 1928.)

Changes in the use and organization of Cavalry Divisions during the Great War, by Major Czegka. When one has arrived at the fact that no one has a monopoly of that commodity, it may often be both instructive and entertaining to note the folly of others.

In spite of the lessons of the Boer War and of the Russo-Japanese War, and disregarding the warnings of some of the younger(!) generation of cavalry officers, the Austro-Hungarian cavalry took the field in 1914, trained on principles gathered from the American Civil War and the Franco-Prussian War, and wearing their variegated uniforms, with full panoply of pelisses, cuirasses and head-dresses of metal or fur, for guarding against sword-cuts.

All these paraphernalia soon went by the board.

The article traces the changes forced upon the Austro-Hungarian cavalry "by the painful and bitter experience of 1914"—training to the

fire-fight, adoption of service-dress, of the bayonet and the spade, down to their complete conversion into infantry, consequent on the loss of their horses.

In 1916 and 1917, owing to the remaining horses being wanted for agriculture and for the artillery, the cavalry were dismounted; and, to a famous cavalry regiment, the Windischgrätz Dragoons, whose exploits dated back to the days of Prince Eugène, fell the sad lot in November, 1918, of having to withstand on foot pursuing Italian cavalry!

Cavalry on the Western Front, 1918. This is a short report compiled by German G.H.Q. in October, 1918, at the request of Austrian G.H.Q. The French cavalry and the German cavalry are both dismissed shortly, while the British cavalry alone gets three-quarters of the report, coming in for much praise for its work on the 8th and 9th August, when its sudden appearance far behind the German front had a great moral effect, and where "it contributed greatly to the spreading of the success of the offensive." In carrying the British line forward, troops and squadrons attacked "with great gallantry," wherever they came upon them, detachments armed with machine-guns. At Harbonnières a cavalry regiment was put in entire and captured "a weakly held German line"—a solitary instance of the use of a large body of cavalry in close formation. Where British cavalry detachments pushed forward against German infantry, who kept their heads, they were shot down; but against badly shaken troops they gained "surprising successes."

Modern Cavalry, by Colonel Wiktorin. All the cavalry's old tasks remain, only the way they will be carried out has changed. The following is recommended as the composition of the modern cavalry division:—

Staff, with 12 motor-cyclists and a military police detachment.
4 cav. regts. (each of 600 men in 7 squadrons; 16 light m.g's, four to each of 4 cav. squadrons; 12 heavy m.g's, six to each of 2 m.g. squadrons; 2 cav. guns, signal troop and pioneer troop, contained in staff squadron).
1 rifle batt. of 400 men, carried on cross-country motor vehicles, with 18 light and 12 heavy m.g's.
1 cyclist batt. of 320 men, with 12 light and 8 heavy m.g's.
1 detachment of armoured cars.
1 light artillery brigade, 16 guns horsed, 8 guns mechanized, and 14 guns in A.A. section.
1 observation echelon of 12 aeroplanes.
1 signal detachment.
1 engineer co. mechanized, with light pioneer and bridging column; also detachments for medical, supply, M.T. and veterinary services.

The Light (Mechanized) Division.—An analysis of a series of articles in the *Revue de Cavalerie*, in which Col. Audibert compares a light (mechanized) division with a modern French cavalry division.

The light (mechanized) division is that which Col. Fuller and other writers propose should replace cavalry. The modern French cavalry division with which it is compared is of the general composition given in the foregoing article. Col. Audibert first states his reasons for thinking

that the light (mechanized) division would be less effective in the performance of its duties than a cavalry division of the special type shown. He then applies the *argumentum ad hominem* by imagining them pitted one against the other, and shows why he thinks the cavalry division (of the special type) would win.

Manœuvres and Skeleton Exercises in Leadership, by Lt.-Col. Irlweck. Manœuvres are an essential part of the education of the troops, but the necessary avoidance of all damage to property, the necessity of respecting preserves, of sheltering the troops only where it suits the inhabitants, and of not interfering unduly with the time-table of the troops' daily routine, are all factors tending to make skeleton exercises more valuable for training in leadership than the manœuvres themselves. For such skeleton exercises, perfect familiarity with the needs and capabilities of the troops is the first requisite. Two more essentials are that all staffs be represented, and that signal communications be complete.

The War Railway Service, by Gen. Ratzenhofer. Every year "War-Measures" were revised in the offices of the Military Railway Service, beginning in October and finishing in time to be put in force on March 1st. This work necessitated an increase of between 80 and 120 officials during the winter months, including the commandants of 28 railway districts and from two to three officials from each directorate of State Railways and of each private railway. These measures fell under two heads, *viz.*, those applicable in common to all cases of war, and those applying to particular cases, *e.g.*, complete or partial mobilization, war against Russia, war against Italy, war in the Balkans, the transport of Italian troops under the Triple Alliance through Eastern Austria on their way to the Vosges.

A precautionary period and mobilization proper were both arranged for. The latter did not necessarily follow the former, and the most difficult task for the railways would be if they coincided.

When the revised War-Measures were issued each year on the 1st of March they became the basis of revision of the mobilization schemes of the troops.

The article then gives in detail the administrative changes in the Military Railway Service on becoming the War Railway Service, and the measures to be adopted by the railways to enable them to deal with the mass transport.

There were on 1st August, 1914, in the Austro-Hungarian Monarchy 92,000 covered goods trucks in working order, and they carried in the first weeks of the War two million men, two-thirds of a million horses and mules, and 200,000 tons of stores, in all a quarter-of-a-million truck-loads, or an average of three trips per truck.

Armoured Cars, by Major Heigl. The author, by means of photographs and short descriptions with the chief numerical data, introduces to his readers the latest patterns of armoured car in use in those European countries which are the most important as far as Austria is concerned.

The first two pictures show all that is permitted to Germany in this line, *viz.*, an armoured, but unarmed, wagon for the transport of troops, and the "Shupo" or Police Daimler, which carries two m.g's, and of which Germany is allowed to possess 150.

Under Great Britain are described with photographs, the old Peerless, which took part in the battle of the 8th August ; the Rolls-Royce, the fastest of all armoured cars ; and the two Crossleys, M23 and M25, which are principally used in India.

Under France we are shown the White-Auto, which, as it carries a 37 mm. gun, is the most effective fighter among armoured cars. Partly on account of its low speed (12 m.p.h.) it is in process of being replaced by the Autochenille. This latter, being armoured and half-track, qualifies for inclusion in Major Heigl's *Taschenbuch der Tanks*, where it is described on p. 148 *et seq.*

The descriptions mentioned are prefaced by some general remarks on m.g. and gun-openings and on types of shutters. This important question, which applies to tanks equally as to armoured cars, has hitherto not been treated separately by Major Heigl, his remarks on the subject finding a place in the *T.T.* only in the chapter in which he tells of tank weaknesses for the benefit of the attacker. In the present article he goes into the subject from the designer's standpoint, beginning with the open gun-port of the White-Auto and of the light Vickers tank ; thence to the shield on the gun, as in the Rolls-Royce armoured car, the American Renault tank, and the heavy Vickers ; and finally to the tight closing m.g. mount, spherical, cylindrical, conical, and double spherical. —(*To be continued*).

A successful attack on an Armoured Car. An account taken from the *R.T.C. Journal* of a fight in a narrow street in Shanghai between a Chinese machine-gun and a Rolls-Royce armoured car. The range is given as fifteen yards, but no mention is made of how the Chinese gun and crew were protected. There were subsequently counted on the car 93 hits ; three bullets, however, went through the openings, wounded the driver and the other occupants, and thus put the car out of action. It was rescued and towed away by another armoured car, while others took up the fight.

The moral is drawn that even infantry may attack Rolls-Royce armoured cars with hope of success, not only because of the observation slits, but because the shield of the Vickers gun stands out six inches in front of the opening which it is intended to cover, and so allows free access to the interior of the car to bullets fired obliquely. The same applies to the older Italian cars and to the French White-Autos. An altogether more difficult matter is when gun and/or m.g. are mounted in tightly closing cylinders or spheres, as in the French tanks and the Czecho-Slovakian a.c's, and when the observation slits are slotted by means of a conical slot-cutter, so as to have an extreme external breadth of only 2 to 4 mm.

Discipline in the Bolshevik Army. Extracts from *Narodna Otbrana*, Sofia. " Disciplinary Instructions," a pamphlet of seventeen pages for the Red Peasants' and Workmen's Army, was issued last year. An obvious initial difficulty when attempting to make soldiers out of revolutionary " brothers " is surmounted thus :—" In order to explain the necessity for the subordination of the Red soldier, it is pointed out that it is not a question of subordination to the officers' class, but of a conscious recognition of the object and signification of the Red Army."

Nevertheless, the Red soldier has to take an oath to keep "revolutionary discipline," and to obey all orders of those placed over him, commandants and commissaries (*i.e.*, military officers and political officers)." Revolutionary discipline" is then defined, point by point; from which it is perfectly clear that it differs not at all from the discipline aimed at by all armies, old or new. The aids to obtaining this discipline are laid down, and, in addition to the usual punishments, include (1) Being posted as a defaulter, up to one month; (2) Name and crime to be read out on parade of the unit; (3) The same as (2) but on a ceremonial parade. There is on the other hand an entertaining list of rewards:—(1) Being thanked (*a*) on a ceremonial parade, (*b*) by means of an official letter, (*c*) in Orders; (2) Grant of a short furlough out of turn; (3) A present with appropriate inscription; (4) A written testimonial publicly presented; (5) Prizes and badges; (6) Being photographed with the regimental colours; (7) Being placed upon the roll of standard-bearers; (8) Presentation with a sword of honour or pistol of honour with inscription and testimonial; (9) Promotion out of turn; (10) The Order of the Red Workmen's Flag; (11) Grant of the Weapons of Honour of the Revolution; (12) The Order of the Red Flag; (13) Eternal inclusion in the Army List.

Apart from its list of inducements to good behaviour, there is nothing revolutionary about the discipline to which the Red Army is being trained, beyond its name.

In God-given Afghanistan as Guests of the Amir (published by Brockhaus, Leipsic). The review of a book by Lieut. Rybitschka of the Austrian Military Police, who was taken prisoner by the Russians at Przemysl, and sent to Turkestan, whence he escaped with two other officers to Afghanistan, where they were interned. The account of the events of that time owing to warlike embarrassments with England, culminating in the murder of Habib Ullah and the vengeance of Aman Ullah, is described as thrilling. Lieut. Rybitschka and the other Austrian officers, who escaped with him, were used as instructors to the Afghan Army, and an interesting account is given of their friendly relations with the chiefs of the wild border tribes. The book, which is called "a treasure-mine for the traveller, and a book of reference for the geographer," is also praised for its historical details, for its descriptions of lands and peoples, for its profuse illustration, and, finally, for its "avoidance of all dressing-up of adventures."

F.A.I.

REVUE DU GÉNIE MILITAIRE.

(*June*, 1928.)—There is an interesting article by Chef de Bataillon Petit on the work of railway engineers in Morocco. Since the construction of narrow-gauge railways in that country, *i.e.*, that from Casablanca to Rabat in 1911 and from Oudjda to Taza in 1912, sappers have been called upon to make the railway bridges suitable for road traffic. This was usually done by putting in extra I girders and replacing the wooden decking by one of ferro-concrete. A description is given of the construction of three bridges on the branch line from Aïn Defali to Aïn Aïcha along the valley of the Ouergha. At low water the width of the

river was about 50 metres, and at flood 150 to 400 metres. It was desirable to make the spans as long as possible, so as to reduce the number of piers, " Pigeaud " girders were therefore used, providing spans of 22·5 metres. The river-bed consisted of gravel and large boulders and lumps of stone, below which was compact clay at depths varying from 2½ to 5 metres. The foundations consisted of caissons made of ferro-concrete sunk into the clay. The area of caisson had to be as small as possible, as pumping appliances were limited, so two caissons were made under each pier, one at each end. The caissons were constructed in rings on artificial islands made in the river-bed. Successive rings were added to the caisson according as it was lowered. The caissons when complete were filled with concrete and each pair forming the foundation of a pier was united by a slab of concrete reinforced with old rails. The pier consisted of two masonry pillars, joined above by a semi-circular arch.

There are pictures of the bridges during and after construction. There is an interesting and spirited account by Colonel Sergent of a small inundation carried out by the engineers between the French and German lines at Kemmel on May 23rd, 1918. At this time the French front was about half-way between La Clytte and Kemmel, facing south-east. There was a pronounced re-entrant in the line at Kaaleput, which was a source of danger. It was decided to strengthen this point by means of an inundation formed by damming the Viverbeck stream. To effect this, a small party of sappers filled up the bed of the stream by means of timber and sandbags at a place where it had been bridged by the English for a narrow-gauge line, the approaches being embanked. The stream at this point was 3·50 metres wide. The operation was successfully performed without the use of nails or mauls, but no record exists of the size of the inundation obtained.

In a well-illustrated article, an account is given of the launching of a steel road bridge over a canal by means of a floating support. This consisted of three boats joined together, on which a staging was built of two trestles and superstructure. Experience showed that the process of lowering and raising the support by pumping water in and out was delicate and tedious, and that it would be preferable to raise and lower the end of the girder by means of jacks.

(*July*, 1928.)—There is an article of 41 pages on the works carried out at Fort Douaumont at Verdun after its recapture, written by Chef de Bataillon Tournoux and Captain Gilson. It goes into considerable detail regarding the repairs carried out and the arrangements for defence.

(*August*, 1928.)—" The inundations on the Belgian front " by Major du Génie R. Deguent is the title of the first part of a long and interesting article. The writer starts with a reference to previous cases, in which inundations have been used for military purposes in Belgium, and then describes the complicated hydrographical system existing in the neighbourhood of Nieuport and Dixmude, through which the Yser flows on a level course. There are six navigable waterways in this area, namely :

(1) The Yser, which is canalized between Rousbrugge, 41 miles from Nieuport, and the sea.
(2) The canal from Ypres to the Yser called the Yperlée canal, which joins the Yser at the Knoche bridge.

(3) The canal from Nieuport to Dunkirk, *via* Furnes.
(4) The Loo canal, which connects the Yser with the Dunkirk canal at Furnes.
(5) A canal joining Furnes to Bergues.
(6) The Plasschendaele canal, joining the canal between Bruges and Ostend to Nieuport.

All these canals are embanked, except the right bank of the Yser south of Dixmude. The dikes and the land between, which is intersected by numerous channels of various sizes, form a vast chequered area. Rain-water is carried off by evacuating canals, into which flow collector canals, which in turn receive the water from the countless ditches with which the land is furrowed. The name of "watering" (Flemish) is applied to the various divisions of this huge system, as also to the association of landowners interested in its preservation and working. Each "watering" is managed by a special body comprising a president échevins, a gréffier, and keepers.

The various "waterings" of the Yser region are :—

Lombartzyde—the system north of Nieuport, the waters from which are evacuated by the Nieu-Bedelf canal.

Vladsloo, Beerst, Keyem, Schoore, Crique de Nieuendamme—systems lying east of the Yser, the waters collected from which are evacuated by the Old Yser (the old unnavigable river-bed of the Yser).

Dixmude, Blanhaart, and others lying east of the Yser, which are evacuated by that river.

Furnes or Veurne-Ambacht, a large system south of Nieuport, between the Yser and the Loo, finally evacuated by the Veurne-Ambacht or Noordvaart canal, which communicates with the Old Yser by means of a siphon. A third evacuator of this area, the Koolhof, passes in siphons under the Furnes canal (*i.e.*, that which connects Nieuport with Dunkirk and the Loo canal) and joins an old canal, also called Furnes, debouching into the Yser west of Nieuport.

In addition to the above, there are other waterings west of the Loo and Furnes canals.

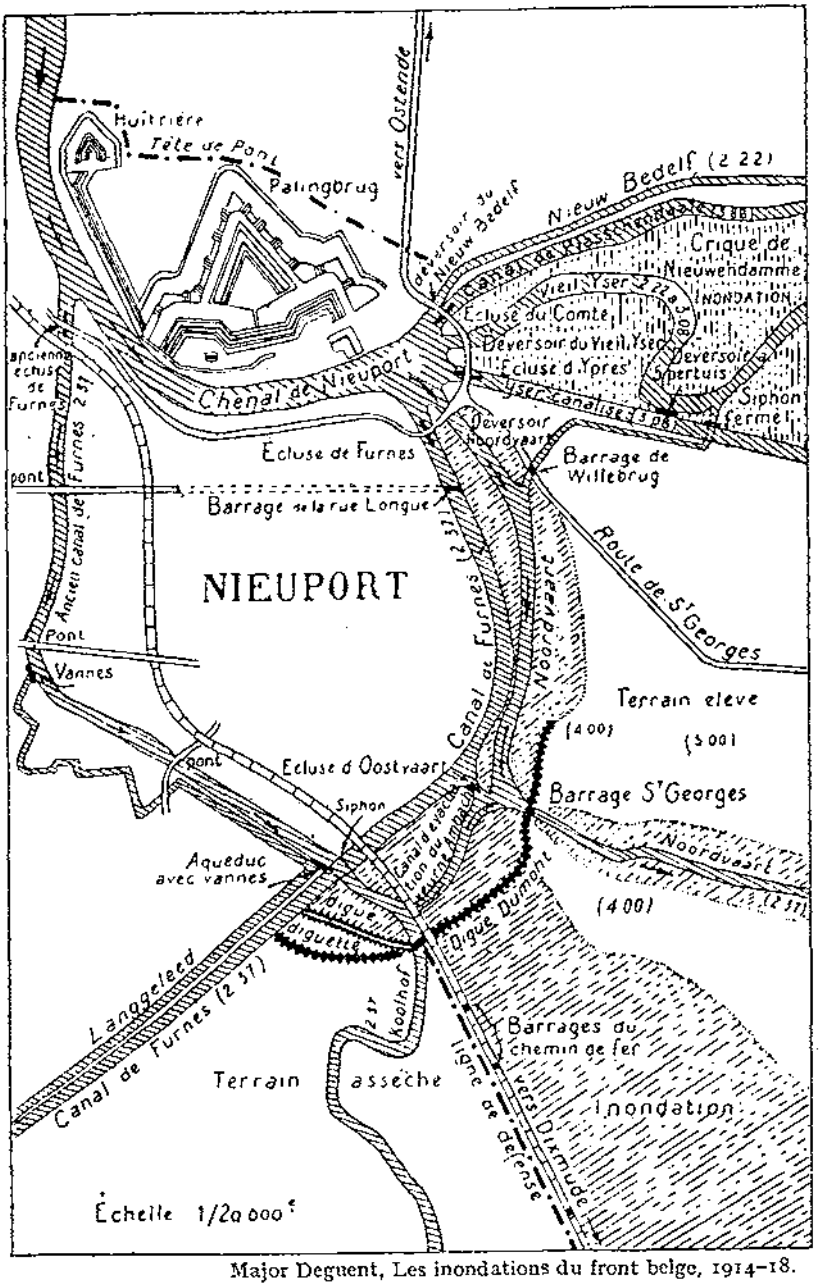
As can be seen from the plan, six canals, two navigable and four evacuating, debouch together at the north-east corner of Nieuport into what is called the "Channel of Nieuport" (really the mouth of the Yser), forming what the writer calls a crow's foot, whilst a seventh canal, the Old Furnes canal, flows along the west side of Nieuport, and debouches into the channel of Nieuport at the north-west corner of the town.

There are weirs and sluices or locks at the outlets of all the canals and at various points along them.

The writer then gives a brief account of the part Nieuport has played in war from its foundation in the 12th century, and how inundations have always been used to assist its defence ; there are three plans showing its condition in 1745, 1794, and 1855. The fortifications were demolished between 1853 and 1858, with the exception of a bastioned front with a demi-lune and a lunette joined to the other works by a covered way, all lying on the north side of the channel. These old fortifications, which had been preserved for sthetic and antiquarian reasons, played a useful part during the War.

The Belgian Army effected its retreat to the Yser on the 13th and 14th

of October, 1914, and on the 13th Lt.-Col. Nuyten, of the headquarters staff, investigated the possibilities of inundation. On the 16th and 17th,



Major Deguent, Les inondations du front belge, 1914–18.

(Reproduced by permission of Chef de Bataillon Roux.)

the army was in position on the Yser with outposts beyond the river and bridgeheads at Nieuport and Dixmude in contact with the German army. On October 18th, the Germans attacked the outposts. Nieuport was

violently bombarded, and a bridge (St. Georges) over the Yser was destroyed. The attacks were continued on the 19th and 20th, and positions north of Nieuport were forced.

On 21st, an order was given for the inundation of the creek of Nieuendamme to protect the right of the Nieuport bridgehead. As the Old Yser was not embanked, it was sufficient to open the sluices of the weir at its outlet to enable the water at high tide to inundate the surrounding ground. But the siphon between the Old Yser and the Noordwaart canal had to be closed at the same time, to prevent the ground south of the Yser canal now occupied by the Belgians from being flooded as well. There was some delay in performing these operations, as nearly all the staff which controlled this complicated system of canals and waterways had left Nieuport, the locks having been handed over to men of the engineers. But, fortunately, an old boatman, Geeraert by name, was found who was thoroughly acquainted with all the details of the system.

During October 22nd, about four square kilos of the creek of Nieundamme was inundated, but on that and the following days the line of the Yser was forced in several places. On the 24th, the Germans established themselves beyond the Yser for a considerable part of the distance between Nieuport and Dixmude, whilst the bridgehead at the latter place was closely encircled. On 25th, after a violent bombardment, the attack was renewed, and the Allied line withdrew to the railway line completely exhausted.

At this point, Colonel Nuyten was struck by the possibilities of the railway embankment which traversed the large area of low ground between the Yser and the Loo. He applied for information to an old lock-keeper called Cogge, who had served many years in the Furnes watering, and learnt that it was possible to inundate the ground east of the embankment by blocking up the openings in it, so that it would act as a dike, and letting in water from the Channel of Nieuport. A reconnaissance was made the same day to find out where the embankment would have to be dammed and how water for the inundation could best be obtained. There was no question of using the Yser, as it was now in the area occupied by the Germans. Water could have been obtained through the Noordvaart evacuating canal, but the keys of the sluices in the weir at its outlet had been hidden, and at the moment no one knew where they were. It was therefore proposed to use the Old Furnes canal, water from which could be obtained by opening the lock at its outlet (a thing which had not been done for 35 years), whence it would pass in the siphon under the Furnes canal into the Noordvaart. But as the Old Furnes canal connected with the Noordvaart through an opening in the railway embankment, it was necessary to construct a dam, in the angle between the dike of the Furnes canal and the railway embankment, to prevent the ground west of the railway being flooded. It was expected that the inundated area would amount to 25 square kilos.

Accordingly, at 16 hours on October 25th, the order was given to start work on damming the openings (22 in number) in the embankment. The work was carried out by Belgian engineers between the evening of the 25th and the morning of the 27th, the enemy being 300 to 400 metres away.

On the 26th, the situation became desperate; the artillery had run out

of ammunition and the Belgian line had retired to the railway, which was to be held at all cost. In the evening, the bridgehead of Nieuport was abandoned, leaving the hydraulic works, which included those which controlled the sluices and locks in the " crow's foot," in the hands of the Germans. By the evening of this day, work was so far advanced that the order to inundate was given. At 4.30 on October 27th, Capt. Thys, of the Engineers, and Cogge, tried to open the gates of the lock at the outlet of the Old Furnes canal, but were unable to do so. The sluices in the gates were, however, opened, though the result could be but slight. Cogge then suggested making a breach in the east dike of the Furnes canal between the lock at its outlet and the railway bridge, and asking Dunkirk, with which this canal communicated, to supply water. The breach was made, but on the 28th information was sent from Dunkirk to the effect that no more water could be supplied, which is not surprising, as the tides on the 27th and 28th were not very high.

On the night of the 27th/28th, the gates in the lock at the outlet of the Old Furnes canal were at last opened. A gun had been laid on the gates so that they might be burst open if necessary, but if this had been done the inundation would have been subject to the rise and fall of the tide. It was arranged that the gates should open automatically with the rising tide, and close with the ebb. By the morning of the 29th, the third tide had occurred since the gates were opened, but the result in the shape of inundation was hardly appreciable. This was probably due to the fact that the soil and the small ditches intersecting it absorbed a great deal of water, and that the actual flow down the canal was obstructed by the numerous bottlenecks formed by the bridges over it, and also by the siphon under the Furnes canal, the ports in which only amounted to five square metres in area, and were partly blocked by objects such as barrels and planks, which had been floating about in the canal.

In view of this poor result, and the desperate condition of the troops, who for four days had been expecting the waters to come to their salvation, it was decided to open all the sluices in the weir at the outlet of the Noordvaart canal, with the rising tide, and close them with the falling tide, although these works were now in the area occupied by the Germans. And so, at 19.30 hours on the 29th, a small party sallied out, and with great good luck found that the weir was not held by the Germans. The handles of the sluices, which had been hidden in a bush, were recovered, and the sluices opened. High tide was at 21 hours, and at about midnight, when the tide began to ebb, the sluices were closed. At 6.30 hours on the 30th, the Germans launched a general attack on the line Nieuport-Lille. They reached the railway embankment and occupied Ramscapelle on the west of it. But the advancing floods had by midday appeared in the fields to the east of the railway, and the Germans retired. The waters had saved the situation.

It had taken 16 hours after the opening of the sluices in the Noordvaart weir for the water to reach a distance of 4 or 5 kilos. This happy result was largely due to the fact that the tides at this time were on the increase, and the wind was favourable. On the 31st, Ramscapelle was recovered and the railway embankment was reoccupied throughout its length. A.H.B.

CORRESPONDENCE.

SCIENTIFIC SOLDIERSHIP.

The Editor, *The R.E. Journal.*

SIR,

With reference to Colonel MacLeod's letter, which appeared in the September number of *The R.E. Journal*, I will answer his points as briefly as I can.

1. *Infantry Armament.*

It is true that infantry may be given a weapon which will penetrate tank armour, but this weapon will not directly increase their mobility. It is the lack of mobility which I consider will eventually render infantry obsolete. Again, infantry cannot carry armour, consequently, in no way can they protect themselves *directly* against tank fire. At certain ranges the tank will be immune (whatever weapon infantry are armed with), whilst at no practical range will infantry be immune. The tank is, therefore, the only weapon which *on equal terms* can meet the tank (see paragraph 4 for artillery).

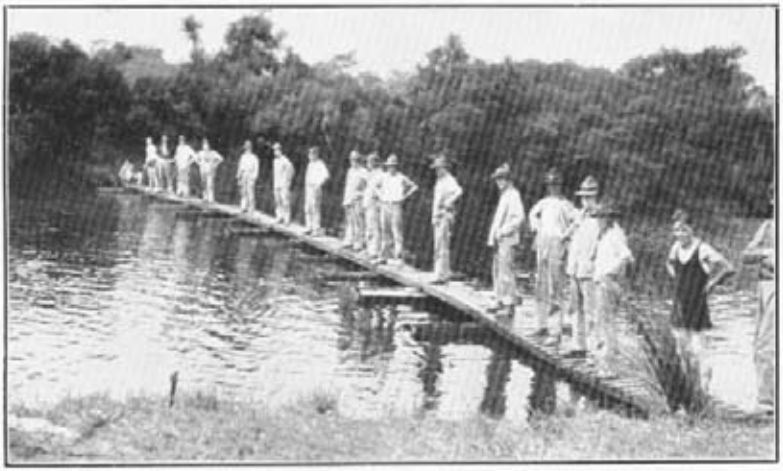
2. *The Bullet and Armour.*

Since 1861, there has been a general tendency towards static warfare. The reason is the rifle bullet. The Civil War in America, the first great rifle war, was largely a war of trenches, and during it, seven out of eight frontal attacks failed. The Franco-Prussian war saw trenches, but not many; yet neither Prussians nor French succeeded in a single frontal attack. The Russo-Japanese war was largely an entrenched war, and the World War was almost completely so. When both sides are equal in numbers and weapon power, theoretically it is impossible for the attacker to gain fire superiority, because one rifleman on the defensive can kill twelve to twenty attackers before he himself is killed. Why then waste time on inventing superior rifles and on more intensive musketry training (which the enemy may also do), when half-an-inch of steel will definitely kill the bullet.

3. *Armour and Morale.*

Armour is a means of protection; we talk of defensive armament, therefore, I think we are justified in calling armour a "defensive weapon," a shield, though technically this may be incorrect. In my opinion, armour has a potent moral influence on the soldier. For example: I am terrified if I am put into a den of lions; but if I am in a lion-proof cage in the den I have no fear. Again, outside a tank I am frightened by bullets, inside it I am not. It is not a matter of hiding behind armour, but of rendering myself immune to bullets, just as one renders oneself immune to rain by an umbrella. For this reason we are

Building Footbridge.



Footbridge in position.

Launching Pontoons.

Pontoon Bridge completed.

Pontoon Bridge

all very brave in peace time—there are no bullets. Mobility is gained by armour as it eliminates the bullet, and it is the bullet which restricts our movement.

4. *Armour and Effective Range.*

Suppose that infantry are armed with a weapon which will penetrate tank armour up to 500 yards range. Then at 600 yards the tank is immune, but the infantry are in no way so, even at 2,000 yards, from a ·303 M.G. bullet. To avoid guns, the tanks move behind them. If the guns are mechanically propelled, they may move as fast as the tanks. If these guns are unarmoured, they may move faster. But the tank can attack and defend itself with bullets and shells, and protected by its armour it can only be put out of action by shells. After the first of such actions, I think, the gunner would at once ask for protection against bullets, namely, armour, and given it his mechanized gun would become a tank.

In my opinion, all Colonel MacLeod's errors, if they are errors, pivot on the fact that he thinks of mobility, protection and offensive power in water-tight compartments, that is as separate quantities. In my opinion we must always think of them as inter-related, forming one compound —tactics—and not merely three un-unitable elements. In H_2SO_4 (sulphuric acid), H is as important as S, and S as O. In tactics, protection is as important as mobility, and mobility as offensive power. When these three are correctly related tactics flourish, when otherwise tactics do not. I think my theory of area warfare still holds good.

I am, etc.,

29/10/28. J. F. C. FULLER.

NEW ZEALAND NEWS.

THE Corresponding Member for New Zealand has kindly forwarded the photos reproduced, together with the accompanying letter :—

Headquarters,
Northern Military Command,
Auckland,
New Zealand,
15. 6. 28.

MY DEAR COLONEL,

I must apologize for not writing before. * * * * The photos I enclose are of interest to Sappers, and were taken during the recent camp of the Northern Depot, N.Z. Engineers, at Nyarawabia, where we have a mobilization depot for a Brigade Group. The great Waikato River runs past the camp, and the photos were taken on a tributary of the river. I am glad to say our Northern Depot of Sappers has at last good technical officers. It is one of the most popular units in the Command, and is what one may term a first-rate show. * * * *

Yours very sincerely,

J. E. DUIGAN.

WIRE-NETTING ROADS.

With reference to the previous correspondence on this subject, Brig.-General C. W. Singer, C.B., C.M.G., D.S.O., writes: "*Re* wire-netting on sand roads, it may be of interest to hear that when we took over from the French at Nieuport, in the summer of 1917, many of their paths in the sand dunes were netted, and we kept up the practice."

RAILWAY DEMOLITIONS.

To the Editor, *R.E. Journal.*

SIR,

Major Simson's interesting article in the *R.E. Journal* for June, 1928, recalls one or two lessons on railway demolition learnt by the Railway Troops on the Western Front in the 4th and 5th Army areas during the Great War, and which seem in danger of being forgotten.

First: demolition of joints in flat-footed rails by charges placed *under* the rails is more effective than with those placed against their sides. A greater length of rail is rendered unserviceable, and repairs are much slower if wholesale track demolitions are done in this way.

Second: the destruction of trestle bridges by explosives hastily placed is always much more difficult than it appears at first. It is probable that charges consisting of plastic or powdered high explosive, such as dynamite or ammonal, placed in large auger holes made in the various members of the bridge, will always be more effective than slabs of gun-cotton laid against one or two sides as described in that article, because a greater length of timber is spoilt by the splitting action which results from the explosion. A hole filled with gun-cotton primers should have a similar effect.

The best way of demolishing such a bridge is, as Major Simson says, to set it on fire. But anyone who has tried to do so knows that this is not so easy as it would at first seem, particularly if the gap bridged is a wet one and the timber more or less saturated throughout in consequence. In spite of the application of almost unlimited petrol, the results of such an effort to set fire to one of the Somme pile bridges in the retreat of March, 1918, were poor. Ought we to add "Practical Incendiarism" to our training programmes, and carry equipment for this purpose?

Yours faithfully,
E. P. ANDERSON, *Lt.-Col., R.E.*

Lahore, 2nd Sept., 1928.

TRAINING MANUALS REVISION.

IT is proposed to include, in a volume of Military Engineering, notes on the following installations, etc. :—

Petrol Depots,
Cold Storage Depots,
Ice Factories,
Mineral Water Factories,
Bakeries,
Laundries,
Aerial Ropeways,
Mechanical Excavators,
Cranes, Conveyors, Battery Trucks, and other Depot and Port Appliances.

Will any officers who have had experience of any of these and can supply useful information, or are prepared to criticize such notes as are available, get into touch with the Officer i/c Training Manuals Revision, Room 037, War Office, Whitehall, London, S.W.1.