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# *THE STRATEGIC EFFECT OF FORTRESSES AS ILLUSTRATED BY MILITARY HISTORY SINCE 1800.**

*By* T. Miller Maguire, LL.D.

The art of fortification is as old as war itself, and is not confined to civilised communities. Our troops have experienced in every part of the world the fact that even savages see the importance of adding to natural shelter or protection artificial aids, whether of stones, earthwork or felled trees. Savages attain to considerable skill in this direction, and go so far as to provide flank defences as well as exceptionally strong works, such as New Zealand *pahs*; even the Red Indians throw up hasty entrenchments.

Among the civilised nations we see that fortresses at an early date assumed tremendous dimensions. Traces of these remain from the Danube and the Levant to Pekin. A large part of the history of China is connected with the Great Wall—the most stupendous of human undertakings, greater even than the Grand Canal of Kublai Khan. And the sieges of the towns in the Valley of the Euphrates, such as Nineveh and Babylon, as well as the sieges of Jerusalem, in ancient and sacred records, were epoch-making incidents. So again all through Grecian history sieges like those of Syracuse, of Tyre by Alexander the Great, of Carthage, and many an attack on Rome itself and attacks on Constantinople, not only by Russians and Mahommedans but by Christians, were noteworthy events.

Timour, or Tamerlane, destroyed all the principal fortresses from Seistan to Bagdad, Damascus and Smyrna, and made pyramids of the heads or living bodies of their defenders.

The Romans were masters of improvised fortifications and earthworks, as well as of the attack and defence of permanent fortifications. We see traces of their works at nearly every strategic point in Europe—from the mouth of the Danube to the Adriatic, and from Belgrade to the Tyrol, and all along the Rhine. We also see traces of their camps scattered all through England. Indeed I should advise any tactician in charge of manœuvres in any part of England

* Report of Lecture delivered *ex tempore* at the Royal Engineers Institute on 5th January, 1905. The lecture was illustrated by large wall maps, but it can be followed with the help of any good atlas.

to look up the records of the Roman camps, and he will probably set perfect schemes if he adopts his offensive and defensive sites to the traces of Roman occupation. This was curiously exemplified in the manœuvres both of 1903 and 1904, particularly in the neighbourhood of Colchester, an old Roman camp.

When, after the chaos of the Dark Ages, the conquering races which had overwhelmed the Roman Empire began to settle down, we find all Western Europe studded over with feudal castles in commanding positions admirably situated for defence. Splendid examples of these are to be seen all along the Rhine, and they are immortalised by Lord Byron in his *Childe Harold*.

Very good examples are also to be found in the South of England; in fact one ruin is close by, viz., Rochester Castle.

Then again in the East, when the Saracens and Turks became masters of attack and defence, some celebrated sieges occurred, in which towns were defended by Christian knights, such as the defence of Rhodes, of Malta and of Jerusalem. And when the feudal system fell, artillery was introduced; the old castles gradually became useless, and quite new systems of fortifications were produced—permanent and improvised lines of defences; Villars' works, called the *ne plus ultra*, against Marlborough, are remarkable examples.

The defensive behind works introduced the mathematical system of the art of war, which spoiled the mobility of the armies in the 17th and 18th centuries. Observe how long it took Marlborough to get from Brussels to Lille. It was not until the French Revolution, bringing in a new power, compelled the French armies to break up and become divisions instead of integers that the true art of war was recognised. It teaches us that fortresses will not save nations; that they are very useful as delaying invasion, sheltering depôts, pivots for armies, covering armies, and as places to which armies can retire and from which they can advance with impunity. The true defence of the nation is the field army, and the more fortresses a nation has the more certain its ruin if it trusts to a merely defensive policy. Not walls, nor mountains, nor rivers, nor even seas can defend a nation; and if these cannot, certainly neither permanent works like Metz nor improvised works like Plevna, nor long walls, nor ridges and defiles can do so. Then what will save a nation? The manhood of the nation. As Lord Bacon says:—"Above all it conduces most for greatness that the breed and disposition of a nation be stout and warlike."

Fortunately for me your authorities very wisely narrowed the scope of my lecture to illustrate the effect of fortresses on strategic or grand manœuvres before and after decisive battles from history since 1800. They did not suggest that I should dwell upon the details of fortification or discuss the rival principles of fortification. We must

take it for granted that each general and his engineers displayed, according to the resources at their disposal, a sufficient amount of skill; and that at each epoch the fortifications of each State were fairly up to date, as indeed they were both on the Continent of Europe and in America. Even as to Manchuria I have not heard from any authority that there are any grave defects, from the point of view of your engineering art, in the efforts of the Russians either at Port Arthur or at Liao-yang or on the Yalu.

It is said that the French fortresses in 1870 were not in as good a condition for defence as they ought to have been, but this was the fault of the Government and not of the engineers; and at any rate three of them—Strasburg, Metz and Paris—were of sufficient importance to cause all the German operations to be in the first place directed to their isolation and capture. Also in the American Civil War the generals on both sides displayed extraordinary skill in improvising fortifications all through Virginia and Georgia; and not only so, but they followed the example of the Roman legions and constructed fortified camps whenever they rested, and even put up some kind of hasty entrenchment during the progress of several battles. Similarly the Turks, at Plevna and other places during their struggle with the Russians, were not behindhand in the art of defence.

At present attention is being directed—and very properly directed—to our strategy in the North-West of India. I have shown that in Europe history in regard to the lines of invasion simply follows the roads of the Romans, and that we find modern works wherever a Roman strategic, decisive point was located. We also find that Alexander the Great attached precisely the same importance to Egypt, 333 B.C., as St. Louis attached to it in the 13th century and Napoleon in 1798, and as the British both when they sent Nelson to the Nile and in 1882 when they stormed the works of Tel-el-Kebir, and also as they attach to it now. So the lines of invasion and the fortresses, which led through Central Asia to the Indus and thence to Delhi, were precisely the same in the days of Alexander the Great (who thought he was following the example of Hercules) as in the days of the Moslem invasions. Timour discusses all of them in his *Institutes*. And both Akbar and Baber, emperors and conquerors, distinctly lay down that the keys of India are Herat, Kabul and Kandahar. Herat was founded by Alexander the Great. The Russian General Sobeleff has discussed our fortified position at Quetta, which he said could easily be turned into another Plevna, and Skobeleff proposed to imitate Timour's invasion with great hordes of cavalry.

These are far-reaching illustrations of the necessity for appreciating, seizing and preparing to defend well-known positions. And so long as discussions such as are now common as to the future conflicts and divergent interests of States in different parts of the world

prevail, my audience of Royal Engineers need have no fear of its occupation being gone.

I will now show how particular fortresses influenced particular campaigns since 1800; and also that to trust to fortresses is a mistake, that the field armies should be kept away from them, and that they often prove a snare. It is also clearly proved that when invested they should always hold out to the very last, regardless of any humanitarian consideration. This is laid down by Napoleon and by Blucher, and in fact it is only common sense. What is the use of such expensive and formidable apparatus of defence, what is the use of engineers exhibiting ingenuity and a nation spending enormous sums of money, if the general in command at the particular moment surrenders before the works are half taken or the rations are all eaten? Any attempt to blend humanitarianism with war generally doubles instead of diminishes the misfortune of a country. There are cases in which even one day's delay might have saved a city—the relieving army was almost in touch with the fortress when it surrendered. The Archduke Charles says: "All that a great nation requires when it is invaded is time to develop its resources." It is the duty of the officer in command of a fortress to utilise the ingenuity of the engineer by making that delay as protracted as possible and the capture of his trust as costly as possible. It should also be remembered that the most elaborate systems of fortifications have been thrust aside or turned.

In 1800 Genoa was the last position left to the French by the Austrians and Russians of all the great conquests of Napoleon in Italy in 1796–97. It was invested by sea by the English fleet and by land by the Austrians. Massena was in command and he determined, to use his own words, to "eat his boots"; nor did he capitulate till his men and himself were reduced to the very last extremity. The eyes of all Europe were fixed on Genoa. Napoleon determined to defeat the Austrians, and it was generally supposed his objective would be Genoa, and that he would enter Italy either by the Corniche road between Nice and Genoa or by the Cenis Pass. Both were closed by the Austrian armies and the siege was vigorously pressed, but Napoleon recognised that if he could defeat the field armies of the Austrians it made little difference whether Genoa fell or not. Similarly, if the Russian forces defeat the Japanese in the field the fall of Port Arthur will not affect the final issue in the least. Napoleon therefore made a surprise march into Italy by the Great St. Bernard, reached Milan, and hurried over the Po by Piacenza to Marengo while the Austrians were concentrating at Alessandria. Now Massena just occupied the Austrian forces, which ought to have been closing the passages of the Po, a day or two too long at Genoa. The result was the battle of Marengo, the defeat of the main Austrian army and the recapture of Genoa.

on the plains of Vitoria. This he might have done but for the British command of the sea and for the ability of Wellington in mountain warfare. Wellington says he could not, except for the aid of the Navy, have taken San Sebastian at all, or moved up his base from San Sebastian to Bayonne. On a small scale San Sebastian was extremely like Port Arthur; it was on the left flank of an advance into a Continent from a Peninsula, and it promised to provide a harbour to the British on an inhospitable coast. Of course the tonnage of vessels then was very different to what it is now. The British transports were only about 500 tons, whereas ships of the present day have twenty times as much tonnage; and some of you went out to South Africa in vessels that would carry a very considerable portion of the whole British Army that landed in the Peninsula in 1808. Soult now defended the South of France by a series of works, described by Napier, which delayed the British from August to December before they could get to Bayonne. He then retired to the fortress of Toulouse, and the enemy could not take it till April, 1814.

My time presses and hence I must hurry on to America. Vicksburg, on the Mississippi, cut the Northern forces at New Orleans and at St. Louis and Cairo in two. It had to be taken, and this compelled the Federals to spend an enormous amount of ingenuity and money in 1862–63. I have already referred to the improvised works during the American Civil War. But Lee understood the true use of fortifications—not merely to exhaust the energy of the attack on a purely defensive system, but also as a pivot for offensive manœuvres. From the works on the Rapidan, near Chancellorsville, in 1863, he allowed Jackson to sally forth to turn Hooker's right; at Richmond he delayed Grant from the middle of 1864 to April, 1865; and as his last avenue of escape was well nigh closed, he went out and was only compelled to surrender by a combined attack by Grant and Sheridan at Appomattox. There is not the slightest doubt, as Colonel Henderson has proved, that the Confederates, although their armies were improvised, made more skilful use of works than most of the regular armies of Europe have done.

The history of the Crimean war is practically a story of how Todleben not only improvised the works at Sebastopol but skilfully held them for a lengthened period, thus preventing any inroad on the main lines of Russia; and he ultimately evaded the Allies, notwithstanding their naval and military superiority in the Crimea.

The importance of a flank position of a permanent character and well held is shown in the Franco-German war. Strassburg obliged 60,000 men to be detached after the battle of Worth from the main body of the Germans; and in spite of the splendid successes of Borny, Rezonville and Gravelotte, the German advance on Paris was rendered risky by the defence of Metz, which caused the detention of

which armies could conveniently enter Spain. Wellington resolved to break the French front and to take these fortresses at all risks before they could be relieved by the covering armies. He first stormed the northern fortress at great loss of life, and then the southern in the most sanguinary scene of the long revolutionary wars—the most terrible assault between 1793–1815. He precipitated the assault to gain time. He was severely blamed for his lack of humanity; but he was easily able to prove that, if either or both of the Marshals had come to the rescue of the fortress, to have beaten them off would have probably cost even more men, and if they had relieved the fortress the war would have been protracted over a whole year.

A similar answer, I believe, would be given by the Japanese, who are now making such desperate assaults on Port Arthur. They have no desire to kill their soldiers, but time is of the utmost importance to them. If Wellington in 1812 and the Japanese in 1904 were not prepared to take the enemy's works at all costs, it was only trifling with their interests to detach troops to invest them; it would have been much better simply to have watched them.

Now these successes of Wellington in January and April, 1812, were the foundation of all his future victories. It gave him a fortified frontier to fall back upon in his subsequent retreat in the same year, and it gave him a fortified post from which to advance in his brilliant advance of 1813. But when he advanced in 1813 from Salamanca as far as Burgos, he found his line of communication too long and the supply of transport scarce. Accordingly he did what the Japanese have done and what the American Federals did; he used his sea power to cover the flank of his advance. He transported his base from the mouth of the Tagus and Douro to the northern Spanish coast at Santander, where he was supplied from his left. Thence he ventured on, and the French had to retreat step by step, across rivers, abandoning positions, in deference to his turning movement; just as Kuropatkin was obliged to move off, lest he might be nipped by Oku on his right and by Kuroki on his left, so King Joseph was forced to retire from the Ebro to Vitoria, where he was defeated on his front, turned on his right, cut off from his main road to the fortress of San Sebastian, and driven to retire in tumultuary manner (losing 151 out of 152 guns). Kuropatkin is not in so bad a case just yet.

The Peninsular War had been going on since the summer of 1808; and in June, 1813, Wellington, on the one hand, determined to invest the frontier fortresses of San Sebastian and Pamplona, and Soult, on the other hand, who took the place of the unfortunate King Joseph (a general to whom his brother the Emperor was always inditing strategical and tactical lessons in vain), determined not only to protect the two fortresses but to turn the tables on the English by relieving the fortresses, breaking their front, and beating them

to interpose between the Prussians and British, and consequently he did not advance by any road where there was a delaying fortress such as Mons, Tournay.

A certain school of military writers in England seem to have imagined that, because an officer belongs to a race which was the first to apply the true principle of artillery in Europe, and which has done more fighting for a longer period with success than any other European race except the Romans, he cannot possibly be worthy of providing them with sufficient material for thought in the present or that his performances in the past can be of any value by way of instruction for the future. It may therefore be a surprise to some that I propose to quote the operations of the British in Spain and Portugal as giving admirable lessons both in defensive and offensive warfare, the skilful use of the command of the sea, masterpieces of improvised works, as well as desperate assaults and successful enterprises against permanent fortresses. I must not give my own opinion, as it might seem prejudiced; but if any of you will at your leisure consult General Veal, you will see that, in the opinion of the authority at St. Cyr, Wellington's defence of Portugal, his use of fortresses on the frontier, his skilful abandonment of fortresses, his retirement, deceiving Massena into the belief that he was going to evacuate the country, his elaborate lines of Torres Vedras (covered on each flank by sea power and invulnerable in front) are the best possible methods of defending a country which is determined to resist *à outrance*. And then, when Massena was exhausted before the works, Wellington's advance is regarded as an admirable illustration of defensive-offensive operations, securing the entire deliverance of Portugal.

Strange to say Russian records prove to us that the Tzar Alexander I. urged upon his generals the immediate adoption against Massena's master, Napoleon, in 1812, of the plan which Wellington followed in 1810–11; and Kuropatkin's withdrawal from the Yalu to the Sha-ho, and the retreats of Jackson in Virginia and of Johnston in Georgia in 1864, are based upon principles of which Wellington was the very ablest exponent. I have been trying for twenty years to induce our authorities, while carefully culling information from every other national history, to encourage our own soldiers by impressing upon all instructors the necessity of doing what Sallust advised the Romans to do—"Seek for examples of heroism among men of their own race." Therefore I make no excuse for taking some of my illustrations from the Peninsula.

In the first months of 1812 the French military system in Spain, which involved making war support war or living on the country, caused their Corps to be scattered; but their front as regards Portugal was covered by two fortresses, on the north by Ciudad Rodrigo and on the south by Badajos. These commanded the only roads by

From the above illustration we can prove that it is often a good thing for a State to let a fortress go. But this is a difficult thing for a general to do; the people and the Press would make a great clamour if a fortress were abandoned to its fate, and it would require a Napoleon or some other person of commanding personality to take the responsibility. But the Archduke Charles in 1796 abandoned all Germany as far as Ratisbon, and kept on retiring until he found it convenient to make a counter stroke. In 1805 Ulm proved a trap to the Austrian General Mack, who held it too long, till Napoleon and his marshals converged from the Maine and Rhine, isolated him, and took him prisoner. Then there was not a sufficient field army between Napoleon and Vienna, which he entered with ease. In 1809 the effect of fortresses on a parallel river was felt by Napoleon; for, as he advanced from the Danube to Vienna, he was obliged to detach troops all along the Danube—at Passau, Linz and Krems; and accordingly, when he reached Vienna and found he was threatened on the north bank of the Danube at Essling, he had too few men for his purpose.

This leads us to another consideration—that the proper way of defending a capital is by relying not on fortresses or defensive positions astride the enemy's path so much as on the fortresses or entrenched positions on the flank of his path. We will see this well illustrated when we come to France in 1870.

In 1806 Napoleon's objective was the field army of the Prussians. He, therefore, immediately after beating them at Jena and Aeurstadt (Oct. 14, 1806) ignored Magdeburg and the other forts and went straight into the unfortunate capital Berlin. Before the field armies could recover themselves Prussia was crushed.

In the campaign against Russia in 1812 there were, after the great battle at Borodino, practically no fortresses except Smolensk to protect the Russians, who drew the enemy into the heart of the country, into their own ancient capital which they burned themselves. The Russian army was then put on the flank of the invader, who had to retreat with enormous loss. In the campaigns of 1813–14, when Napoleon was retiring from the Oder and Elbe across the Rhine to his last great stand between Vitry and Paris, the pursuing Russians, Austrians and Germans ignored the fortresses; and although the allies were in France, curious to say a very considerable number of French soldiers were holding fortified positions in Germany. On the other hand it is very probable that, if Paris had been fortified in this campaign, Napoleon's resistance would have been prolonged; but there was scarcely any chance of its being successful even then except through dissensions among the allies; he would not have been successful from a strategic point of view.

When celerity is an object, fortresses will often determine the choice of the plan of operations. Napoleon in 1815 was in a hurry

240,000 Germans. If MacMahon had retired to the southern flank, where there were ample supplies, and played a waiting game, and collected together the reinforcements which afterwards joined, in all probability the investment of Paris would not have taken place for a considerable time later. But MacMahon made a flank march to the relief of Metz, which ought to have been left to its own resources for weeks at least, in such a fashion that he was skirting the frontier, thus giving the Germans a chance of causing him to fall back on the old fortress of Sedan, which, like Metz, proved a trap; the result was fatal to the regular armies of France. On the other hand, in justification of the Archduke's remarks about the delaying power of fortresses, every day that Metz and Paris held out was increasing the probability of a German disaster. The situation of the Germans on the Loire and on the Somme was only saved by the fact that the fall of Metz released a number of German Corps, which spread themselves out towards Besançon, Orleans, Le Mans, Rouen and Amiens and, by preventing the possibility of relief, caused the fall of Paris through starvation.

I am no advocate for trusting to fortresses; no more are the Germans, who have now few forts compared with France. But an army on the flank of an enemy which is invading can never be ignored, and if it is in a strong position it will be a source of danger.

Kars, in point of fact, blocked the way to the Russians into Asia Minor, but Plevna was a surprise. After they had passed the Danube at Simnitza-Sistova they were quite prepared to have to detach large forces to their left before crossing the Balkans; they were prepared for a detachment in the direction of the well-known quadrateral, the fortresses of Varna, Shumla, Silistria and Ruschuk. When they took Nicopolis they considered the roads over the Balkans to Adrianople safe. But Osman Pasha improvised earthworks round the little town of Plevna, and kept them so occupied that at last, after many unsuccessful assaults, one costing 18,000 men, Todleben resorted to investment, and, like Lee, the brave Turk, after his resources were exhausted, tried to escape in vain. However, it is not easy to conquer a determined race, whether they dwell by the shores of the Bosphorus, or by the shores of the Channel, and the Russians found the Turks exactly imitated Wellington in the south of Portugal. Having the resources of Asia Minor behind them they covered each flank of a position about forty miles north of Constantinople, called the lines of Buyuk Tchekmedje. Even as Massena was foiled by Wellington, so the Archduke Nicholas was foiled by Mehemet Ali. The Russians could not force the lines; their army was completely exhausted; provisions were scarce; the country back to the Danube was completely devastated, as was Portugal in 1810. Sea power they had none, because, to complete their difficulties, the British Fleet, under Admiral Hornby, had seized

upon San Stefano. They had no medical supplies nor comforts; at least 30,000 out of 80,000 were unfit for duty through enteric. In fact Kuropatkin's men at Sha-ho were incomparably better off than were the Tzar's men in front of Constantinople.

This again shows the strategic importance of fortresses, if a nation is resolved to hold out and if they are used as snares or traps. If Osman Pasha had only retired south a couple of months sooner, there were other flank positions which would have so opposed the Russians that in all probability they would have been glad to retreat.

Thus, without going into details, I have illustrated to you the importance of a proper application of your art in all parts of the world—from Palmyra to Acre, from Constantinople to Paris, from St. Louis to New Orleans, and from Vicksburg to Savannah.

In conclusion I cannot refrain from expressing my hearty appreciation of the honour conferred on me in being allowed to occupy such an excessive amount of the time of a Corps which, under the proud motto of "Ubique," has illustrated the annals of permanent and field engineering, not only in the Iberian Peninsula by works rivalling those of the Roman Emperors, but in almost every part of the civilised and uncivilised world over which floats the banner of St. George.

# *AERONAUTICS IN AMERICA.*

*By* Bt.-Lieut.-Colonel J. E. Capper, c.b., R.E.

The Managers of the Louisiana Purchase Exposition held at St. Louis, Mo., U.S.A., had offered very considerable rewards for operators and inventors who should prove successful in a variety of Aeronautical contests, viz.:—

(1). Racing over a triangular course in the air with a Flying Machine or Dirigible Balloon under certain conditions of minimum speed and distance.
(2). Ascending in any form of Flying Machine, Air Ship or Balloon, and descending safely closest to any named spot.
(3). Ascending in a free Balloon and making the longest journey in any direction before again reaching the earth.
(4). Flying a Kite to the greatest altitude, such altitude to be not less than 1 mile above the ground.
(5). Producing a Kite which, when flown with a given length of cord, would fly more steadily and at a greater angle with the horizon than other kites.
(6). Producing a Motor which would run satisfactorily during a ten hours test, and would prove lighter per B.H.P. than any other motor which passed the test.
(7). Producing a Gliding Machine which would carry an operator and behave best during a series of glides over a certain minimum distance.

There were also Rewards offered for flying machine models controlled from the ground, but not in any way attached to the ground.

It was hoped that the large Rewards offered, together with the amount of advertisement that success in these various contests would entail, would attract to St. Louis representative aeronautical talent from the whole of the civilized world, and also stimulate very largely the efforts being made in various parts of the globe to obtain control of the air, and increase and popularize knowledge of this most important subject.

The jury determining the results of all the contests was to be International in character, and an International Aeronautical Congress was also to be held at St. Louis during the early days of October.

I was deputed by the War Office to visit St. Louis, with the object

of examining, and reporting generally on, the aeronautical exhibit and ascertaining what progress was being made in aeronautics generally.

Before leaving England I was, through the courtesy of Mr. P. Y. Alexander (a gentleman who is probably better acquainted personally with all interested in aeronautics in Europe and America than any other living individual), given a number of letters of introduction to various gentlemen who are interested in Aeronautics, and whom I might hope to see in St Louis or might visit if they lived within reasonable distance of my route.

Among these the most prominent are :—Mr. W. J. Hammer, New York (Flying Machines); Mr. O. Chanute, Chicago (Gliding Machines, and author of works on the Flight of Birds, etc.); Messrs. W. and O. Wright, Dayton (Gliding and Flying Machines); Professor Langley, Washington (Flying Machines); Professor Marvin, Washington (Kites: Air conditions: Self-registering Meteorological Instruments); Professor Manley, Washington (Flying Machines and Light Motors); Professor Zahn, Washington (Air Resistance and skin friction of bodies moving through the air).

Among the Aeronautical World at St. Louis I met:—Major Baden-Powell (President Aeronautical Society of Great Britain); Eugene Federoff (President of Aeronautical Society, St. Petersburg); Capt. von Tschudi (Instructor of Aeronautics and Wireless Telegraphy, German Army); Professor Nipher (Washington University, St. Louis; an authority on Air Pressures); Mr. W. Amery (Practical Experimenter in Gliding); M. Hippolyte François (Inventor of a Dirigible Balloon); Mr. W. F. Eddy (Inventor of a system of photography from above by means of a camera attached to a kite).

## AERONAUTICAL EXHIBITS AT THE EXPOSITION.

Apart from the Contests, there were few exhibits in the Exposition of interest to the Military aeronautical world.

*American Section.*—In the American Section was an exhibit by the Smithsonian Institute of Professor Langley's Flying Machines. One machine was a model which actually made several flights; one flight was nearly ¾ of a mile, when the machine fell, uninjured by the fall, on the motive power ceasing to act. The second was a model of a full-sized machine made by the Smithsonian Institute; this machine was twice tried, and on each occasion came to grief at once owing to defects in the launching apparatus. The general structure of these machines, which are very complicated, is well known. The engines mounted on them are wonderfully light, but were not on exhibit.

There were also some light self-registering instruments suitable for use in balloons and kites. These are designed by, and made for, the Meteorological Bureau at Washington.

*German Section.*—The German exhibit included a spherical balloon and a model of a kite balloon; also what appears to be a valuable system of map-making by means of photographs taken from a balloon.

The photographs are taken by a camera fixed to a horizontal rifle-shaped arm fitted with a spirit level. The camera is set to a definite fixed angle with the axis of the rifle. The magnetic bearing of the line of sight, and the barometric height at the time of taking the photograph, are noted. The sight is pointed at some definite object in the centre of the piece of ground of which a map is required; and when the spirit level is horizontal, the trigger of the rifle is pulled, taking an instantaneous photograph. The process is repeated later from a point at a distance from the position where the first photograph is taken. From the two photographs so taken co-ordinates are obtained from which the position of definite points are plotted. The result as exhibited was a contoured map, about two kilometers square; and it was claimed that the accuracy of the map, both as regards plan and heights, was wonderful. If the system is practicable, the results may be of the highest importance for obtaining contoured maps of ground inaccessible from any position we can reach.

Another exhibit of interest was a model of the apparatus used for winding in long lengths of wire on a drum without unduly compressing the drum.

There was also a fine collection of self-registering barometers and thermometers; articles in which we are very deficient, and which we ought to have constantly at work both when working captive balloons and on free runs.

## BALLOON PHOTOGRAPHY.

Practically the only exhibit was that noted above. I could find nothing specially likely to be of service in the way of cameras, or of rapid means of developing and printing enlarged photographs by any method that would be of use in the field. Where considerable appliances were available, as might be the case in a siege, photographs were very rapidly developed, and the printing was done instantaneously by means of a flash of the "Westinghouse" electric light.

## BALLOON MATERIAL.

None of the balloons at the St. Louis Exposition were made of skin.

*German Spherical Balloon.*—The German spherical balloon shown, used for free runs only, is of cotton, varnished. It is said to be fairly gas tight and to have gone for more than 40 runs.

It has an ordinary valve to let out gas as required, and a tear valve for use on landing. The latter consists of a special strip sewn into the

balloon from top to bottom ; when necessary this strip is easily torn right down by a thin cord, deflating the balloon at once. No grapnel is carried ; when a descent is made the cord of the tear valve is held in the hand, and jerked hard at the moment of landing ; the car has its one bump and then stays in position. There is no doubt that the danger of landing in high winds is much decreased by the use of this valve, as the balloon never drags after touching the ground. On the other hand, accidents have occurred owing to the valve being torn at a height from the ground, bringing the car violently down and damaging the aeronauts.

*German Kite Balloon.*—A model of the German kite balloon was shown. This is made of two thicknesses of cotton fabric with rubber between. The Germans seem satisfied with it as a fabric. The outside is painted a bright yellow ; if this is not done the action of sunlight on the rubber vulcanizes it, and the rubber cracks, rendering the balloon leaky.

I gathered that the Germans are not quite satisfied with their kite balloon. It takes a large number of men to manage it, and a great deal of gas to fill it. They would readily abandon it for a spherical balloon on calm days and kites on windy days, could they get a satisfactory system of man-lifting kites.

*American Balloons.*—The United States Army had no exhibit of balloons. When required they get them from a private manufacturer.

I saw some of the material, and one balloon said to have been used in the Spanish-American War. The fabric is of silk ; it is passed through a bath of pure boiled linseed oil, and then through heavy rollers which express all but a minute quantity of the oil. This process is repeated twelve times ; at the end of this the fabric is said to be gas tight and lighter than when hand varnished. If not wet when folded up it does not stick, nor heat. I saw a quantity, kept wound on a roller, which was neither stuck nor heated. I doubt whether the fabric is gas tight, though holding fairly well.

## HYDROGEN GAS-PRODUCING PLANT.

The hydrogen gas used in the Exhibition was mostly produced by the Newton-Lane process, a plant having been sent out from England for the purpose.

The plant as exhibited consists of three boilers side by side. The steam generated in each boiler can be led into a steam pipe, or passed down through the furnace of the boiler. The boilers are lighted with coal, draught being at first furnished by an auxiliary boiler driving a fan. As soon as the boilers produce sufficient steam the auxiliary is cut off and the boilers furnish their own draught.

The water gas, formed by passing the steam down through the furnace, is led by an underground pipe to a scrubber, where it is

cleaned, and thence to an oven in which are six retorts filled with cast iron shavings. It is lighted and used for heating up these retorts to a white heat. When these retorts are at the correct heat the steam from the boilers is passed into three of the retorts. In its passage over the white-hot iron the steam parts with its oxygen, which forms an oxide of iron, whilst the hydrogen (probably mixed with some water vapour) passes out through another scrubber to the gasometer or wherever required. After a little while the iron shavings become coated with oxide, and will not take up more oxygen. The steam is then turned off and passed through the other three retorts, whilst those in which the oxide has formed are being regenerated by passing a portion of the water gas through them, the gas after passing through the retorts returning to and mixing with that being used to heat them on the outside. It is claimed that the iron oxide is thus again converted into metallic iron, the oxygen combining with the carbon and hydrogen of the gas to form water and carbon monoxide.

The plant takes some hours to heat up before it is available for use; but when running well it is said to give off 100,000 cub. feet of hydrogen of good quality in 24 hours, at a cost of about 50 cents (2s.) per 1,000 feet. The labour required to run it is, for each relief, 1 engineer, 1 driver and 3 stokers. The coal consumption is from $2\frac{1}{2}$ to 3 tons per diem.

It was not running satisfactorily while I was at St. Louis. It was left in charge of a young American mechanic who did not properly understand it, and who had no idea of the chemical process involved; and the men under him were ignorant people who could not be trusted to look after the simplest piece of machinery. The consequence was that bearings were always heating and something going wrong. Finally the retorts got out of order and would not make gas; and I heard that, after I left, a mixture of gas and air took place, was lighted, and wrecked the whole apparatus.

The chemical portion of the plant did not commend itself to a distinguished English chemist, owing to the action of the gases on the retorts and to the extreme difficulty of judging the correct temperature of the iron shavings so as to get them to the proper heat without their melting. I am of opinion, however, that the process is worthy of further examination; it can, I understand, be seen at Manchester. The preliminary cost is not great, there being no special machinery involved. The cost of working is also small, being merely that of a few tons of coal per 100,000 cubic feet and the labour required, which is not excessive and very little of it specially skilled. The cost of compressing would be less than at present, owing to continuous work on the compressor being possible; and it should be possible to reduce the cost of hydrogen to that of coal gas.

There were no means available of testing the purity of the hydrogen produced by the process at St. Louis, but the smell was

distinctly less offensive than that of most hydrogen produced from zinc and acid, and the lifting power appeared to be very fair.

## DIRIGIBLE BALLOONS.

*Baldwin's.*—The show of dirigible balloons was very poor. At the time of my arrival there were two. One belonged to a Mr. Baldwin, and consisted of a small cigar-shaped envelope of varnished cotton, carrying a frame of Santos Dumont type ; it was furnished with a stern screw, driven by a small petrol motor of ordinary construction. Though frequently going to ascend it did not do so whilst I was at St. Louis. I heard it had done so after I left. The President of the British Aeronautical Society, who saw it, informed me it did what might have been expected of it, *i.e.*, it could go on a calm day about 6 miles an hour. It was unable to stay in the air for more than a short time. It showed no progress whatever.

*Benbow's.*—Another, shown by Mr. Benbow, was also a cigar-shaped envelope of poor construction, holding hydrogen fairly well at atmospheric pressure, but not capable of holding it under greater pressure and unfit to stand any considerable internal strain. The envelope carried a small framework, made of bicycle tubing, which held the aeronaut, engines and propellers. These propellers are of novel construction, being paddles so arranged as to beat the air on the downward stroke and fold up on the upward. The arrangement is ingenious, but of little practical utility. Originally there were two pairs of paddles, driven by a belt drive from a motor ; but the envelope proved incapable of lifting so great a weight, and the weight was therefore reduced by altering the arrangement so as to have only one pair of propellers working amidships.

This balloon also I could not see in the air ; but I was informed that it ultimately made a short ascent, on a very calm day, and succeeded in progressing at about 3 miles per hour, proving of no practical utility.

*François'.*—The only dirigible balloon to be seriously considered was one brought over from France by M. François, who had really studied his subject, and understood at least what he was trying to do, though possibly mistaken in his calculations. This balloon arrived on the scene very late, and owing to one delay after another the whole was not ready for filling until shortly before I left. Finally there was a hitch over the gas-producing plant, and when this had been got over the plant itself was wrecked by an explosion. I have heard that all attempts to fill the balloon were ultimately abandoned, so that it has not had a trial at all.

The gas bag is about 50,000 c. ft. capacity (I could not get the exact figure), of good construction—an elongated spheroid in shape. It is furnished with suitable valves and ballonet. Suspended from

the centre portion is a stiff wooden framework carrying aeronauts, motor, propellers, etc. The main framework or car is about 8 ft. long by 4 ft. wide, with extensions to front and rear so that the suspension ropes may bear over a greater length of the envelope, and branched upwards and outwards to carry the screw propellers.

The motor is a 25 to 28 B.H.P. 4-cylinder petrol motor, weighing with fly wheel 270 lbs. stripped. It is carried on two girders in the floor of the car, and is water cooled. Extensions of the car downwards protect it from hitting the ground.

Propulsion is obtained by means of a pair of fans on either side of the car. These fans are driven by belt drive off the main shaft of the clutch, one belt being twisted so that both pairs of fans revolve inwards. The fans are formed of bicycle tube framework, broader at the tip than at the base, set at a pitch of about 18°. Each fan is two-bladed, the front fans 3 meters and the rear fans 4 meters from tip to tip. Front and rear fans on the same shaft are about 10 ft. apart, and the blades on the front are perpendicular to those on the back. The blades of the fans are covered with canvas, those on the front fan for a distance of one-third their length from the tip, those on the rear fan for one-half their length.

M. François claims that by his method of making the front fan smaller than the rear fan, he, as it were, forces the air passing through the fans to keep a conical shape, and thus attains great horizontal stability.

I could not ascertain (not having seen the balloon in the air) what method he used to ascend or descend. There was no apparatus fixed to his car to enable him to go up or down, and he hinted that he must keep something secret. It is probable that he works it by inclining the balloon slightly by altering his position or that of his assistant.

Turning in a horizontal plane is effected by altering the speed of the screws on one side or the other, as required, by means of friction pulleys, which are forced down on to the driving belts by weights and springs and can be lifted by pulling on ropes from the car.

The whole apparatus is well constructed; but whatever are the merits of this balloon, it is still rendered comparatively useless by the gas bag, which cannot stand any great internal strain and so must let out gas when the pressure inside increases, thus entailing the forcing of air into the ballonet in order to keep the form of the balloon and the throwing of ballast to compensate for the loss of gas. When all ballast is expended the balloon must soon come to the ground.

M. François claims a speed of 18 meters per second for his balloon; but, as that amounts to 40 miles per hour, it appears excessively doubtful whether he can attain anything approaching that speed.

## KITES.

There was nothing of particular interest in the kites exhibited.

Competitions took place on three days for kites of any kind. The most numerous entries were of the pattern known as the Malay or Eddy kite, an improved pattern of the old flat triangular kite.

There were several triangular box kites, with the base of the triangles broadened out and connected outside the frame of the kite so to form horizontal wings; and a similar one with the addition of a fin at the back. Two very light Hargreave box kites, covered with Japanese paper, were also flown; and Baden-Powell's hexagonal flat kite.

The Hargreave kites exhibited their superiority as regards stability, ease of raising, and lifting power. The Eddy kites were stable but had little lift. The triangular ones had considerable lifting power, but were very unsteady. The Baden-Powell kites were difficult to raise, but appeared to do well in a stiff breeze; unfortunately they broke away.

Graham Bell's multi-cellular kite was not in for the competition, but flew well on one occasion when exhibited. It is, however, a difficult and lengthy operation to put it together, and it is bulky to transport; it is therefore useless for military purposes.

## GLIDING MACHINES.

Notwithstanding the prizes offered for gliding machines, there was only one entry—a beautifully constructed double aeroplane of Mr. O. Chanute's.

Mr. Chanute informed me he did not anticipate much success, nor did the machine meet with much. The ground allotted was most unsuitable, being a small oval with buildings on one side, raised seats to a height of 25 feet on the other, and high trees behind; the result was that the wind currents near the ground were deflected in all directions, and there were numerous downward currents which would strike the glider on the top and force it rapidly to the ground. Gliding can be properly practised only from the top of a gently sloping hill against a current of air rising up the slope of the hill. This rising current sustains a good glider, and enables it to stay in the air during the duration of the glide.

Mr. Chanute tried a novel means of gliding. The operator (Mr. W. Avery) stood on the ground with his arms resting on the lower portion of the glider, which he carefully balanced. Attached to the front of the glider was a long cord, connected at the far end to an electric winding engine. On the engine being started the cord was rapidly wound in, the operator running along the ground till the speed was sufficient to raise the glider like a kite. When at a

sufficient height the cord was loosed by the operator, and the free machine glided to the ground.

I saw a good many attempts, but never saw a really good glide; probably the pace was insufficient for the machine to glide properly. The best I saw was about 90 feet from a height of some 25 feet in the air. The operator at times allowed the machine to go higher, but I did not happen to be present at those times.

The method adopted was one that might advantageously be used to train operators to work such machines, but is not without danger. The descents were at times rapid, and shook the operator very considerably; finally he sprained his ankle badly and the experiments were abandoned.

## PROF. ZAHN'S EXPERIMENTS ON AIR RESISTANCE.

At Washington I visited the laboratory of Professor Zahn at the Catholic University. Mr. Zahn has carried out a long series of most useful experiments on the resistance offered to currents of air by bodies of different shapes. This is a subject which is of the highest importance in determining the best shapes to give both to dirigible balloons and to any form of flying machine. He has also ascertained by his experiments the amount of skin friction of numerous bodies of varying shapes and different materials.

The experiments, though of the greatest utility, have been far too limited for any but general results to be arrived at; but his work can at least teach us a good deal that has to be avoided.

When it has been determined, as it has been, that at a speed of 20 miles an hour the scientific design of a dirigible balloon, or even of the car, may reduce the total resistance of the air against it by 50 or even 75 per cent. of the resistance against an unscientifically designed apparatus, the importance of such experiments can be readily understood. One of the chief obstacles to be overcome with a dirigible balloon is the enormous air resistance at high speeds. A comparatively small amount spent on such experiments may result in the saving of large sums of money expended on the construction of a full-sized air ship, the design of which is wrong in principle.

In the design of water ships at the present day numerous experiments are made, as regards water friction and wave action, by trying large numbers of models under various conditions of speed before the lines of any new ship are decided on; and this system of actual trial of models is equally important in the case of air ships, where the reduction of head resistance and skin friction is a necessity for success.

Incidentally Mr. Zahn has carried out a few experiments on the resistance of birds' wings, especially of a buzzard mounted in the position the bird takes in soaring flight, and he has ascertained that

the total resistance is wonderfully small compared with the cross section of the bird and its wings.

## PROF. LANGLEY'S FLYING MACHINE.

Another visit paid at Washington was to the Smithsonian Institute, of which Prof. Langley is the head.

The trials made with a model flying machine and, after its successful results, with a full-sized machine manned by Mr. Manley, are well known. Mr. Manley is confident that success would attend their efforts were further funds available. The U.S. Government spent 10,000 dollars on the trials, and have apparently decided to spend no more, at any rate for the present.

In both cases where the full-sized machine was tried it dived headlong into the water, and in both cases this result was almost certainly due to slight defects in the launching apparatus. Unfortunately, after the second accident, the salvors, being ignorant of the delicacy of the structure, damaged it so badly that great expense would be entailed by making it again, so that the machine is still unrepaired.

Though the machine is one of great interest, and may under favourable circumstances be induced to fly, and is doubtless susceptible of management in the air, the launching methods require so much mechanical apparatus that the machine can only be started from the particular place or places where such apparatus exists; its usefulness is thus very seriously limited.

One great feature of the apparatus is the engine, 50 H.P., said to weigh less than 3 lbs. to the H.P. The design of this engine was kept secret until recently, when the Smithsonian Institute determined to show it at the St. Louis Exhibition. Unfortunately the motor tests there were abandoned, but not until the machine had been dismantled and packed for transit; it was still in its cases when I was at Washington, so I had no opportunity of seeing it. It is said to be extremely noisy, and this would make it somewhat unsuitable for a military scouting machine, which cannot desire to advertise its presence.

It appears unlikely that anything will be done to further this machine for some time, nor do I think it advisable to work on its lines. It is delicate, complicated, and both expensive and difficult to construct.

## WRIGHT'S FLYING MACHINE.

At Dayton I visited Messrs. O. & W. Wright, who have for the past five years been carrying out experiments there.

If the work they are doing is carried to a successful issue, we may shortly have, as accessories of warfare, scouting machines which will

go at great speed and be independent of obstacles of ground, whilst offering from their elevated position unrivalled opportunities of ascertaining what is occurring in the heart of an enemy's country.

## GENERAL SUMMARY.

As regards aeronautics I have the following general remarks to offer on my American experiences :—

*Captive Balloons.*—We can learn little or nothing in America as regards the construction, material, and management of Military Captive Balloons.

*Dirigible Balloons.*—There is no sign at present of America coming to the front in Dirigible Balloons. France and possibly Germany are making progress; but there is still much to be done in this line, especially in the designing of shapes and screw propellers best suited to give good results against the resistance of the wind, and in perfecting arrangements to allow of considerable variations of altitude without expenditure of gas and ballast.

*Flying Machines.*—England is very backward. There are strong hopes of success in this direction, and such success, with at any rate small machines, may come much earlier than is generally anticipated. America is leading the way, whilst in England practically nothing is being done.

*Kites.*—I saw nothing in any way equal to the "Cody" kite.

*Meteorological Work.*—Our Government affords but little assistance to work done for the study of atmospheric conditions, air currents, etc. Whilst the importance of a thorough knowledge of these in order to safely navigate the air must be admitted, in the same way as a knowledge of the sea and its tides and currents is necessary for the successful sailor, the British Government affords but little assistance. America and most of the great European nations take active part in such experiments; with us it is almost entirely due to the efforts of private individuals that anything at all is done.

In conclusion I wish to record my appreciation of the very general courtesy and kindness I met with during my visit; and of the generous manner in which the results of experiments, made often at considerable cost and with infinite patience, were placed at my disposal.

# *SEWAGE DISPOSAL WORKS AT DEEPCUT, NEAR ALDERSHOT.*

*By* Lieut. G. C. V. Fenton, R.E.

These works have been constructed to dispose of the sewage from barracks built for two brigades of Royal Field Artillery. The barracks accommodate 1,000 men and 550 horses, and contain the usual complement of married quarters and accessory buildings. The works comprise a silt pit, two settling tanks, and a series of filter beds (5 primary and 4 secondary tanks), all connected by the usual open channels.

*Construction.*—Generally, the foundations consist of 1 to 5 Portland cement concrete; the ordinary brickwork of hard red stock bricks laid in cement mortar, and the exposed top courses of blue Staffordshire diagonal paving bricks. All interior walls are rendered with 1 to 2 cement mortar.

*Silt Pit.*—The dimensions of this are 8 ft. by 5 ft. by 3 ft. 6 inches deep, with a wall across the centre to retard the flow of the sewage. There is a platform, of concrete floated with cement mortar, on which the silt is collected for removal, the liquid being allowed to drain back into the pit.

*Settling Tanks.*—These are 10 ft. by 22 ft., the depth at the upper end being 6 ft. 9 inches and at the lower, where there is a sump pit, 7 ft. 9 inches, the depth of the sump itself being 2 ft. below floor level. The floor is laid with a slope to the sump of 1 in 10 from the side and 1 in 22 from the end.

Between the silt pit and the settling tanks is a Ham Baker screen. The flow of sewage from the silt pit can be directed into either tank by means of a Ham Baker hand sewage valve. The tanks are emptied either by a Ham Baker flushing valve or a Stone's rotary pump. The exit to the tanks is over one wall, which is made 3 inches lower for its whole length than the other walls. Any scum which may rise and any floating material is caught by a scum board, cross section 9 inches by 1 inch, which is bolted to the exit wall and bedded into the others.

*Filter Beds.*—The 5 *primary tanks* are 30 ft. by 22 ft. 6 inches, the depth varying from 5 ft. at the top end to 5 ft. 3 inches at the lower, thus giving the floor a slope of 1 in 120. Each bed can be cut off by a hand sewage valve.

The beds are filled to within 7 inches of the top with clinker in three layers, large stuff at the bottom, 2-inch cube pieces in the middle, and fine stuff at the surface. The clinker is prevented from being washed out by a chamber of 9-inch brickwork at the middle of the lower end, its dimensions being 2 ft. 3 inches by 1 ft. 10½ inches; small holes are left in the bottom courses to permit of the liquid entering. In the outside wall is a small square hole which is opened or closed by a Ham Baker 6-inch penstock, fitted inside the chamber and bolted to the wall. To prevent the liquid discharging over the channel, the wall of the channel, for a length of 2 ft. 3 inches opposite the exit hole, is raised 2 ft. above the level of the channel.

The 4 *secondary tanks* are similar to the primary. Their dimensions are 60 ft. by 22 ft. 6 inches, the depth being 2 ft. 6 inches at the upper end and 3 ft. at the lower, the slope of the floor thus being the same as in the primary tanks.

The clinker is laid to within 7 inches of the top, as before, but in two layers, 3-inch cube stuff at bottom with a 1-ft. 8-inch layer of fine stuff above. The inlets are regulated by hand valves. There are outlet chambers as in the primary tanks, but smaller; and the penstocks are fixed to the outside of the wall.

*Channels.*—The main channels connecting the various beds are 12 inches broad, the branch ones 9 inches.

*Working.*—The works deal with the foul drainage system only, surface water being disposed of separately. The sewage is delivered through a 12-inch main sewer to the silt pit, where all the heavier solids are allowed to sink, and are constantly raked out and carted away to be buried. It then passes through the screen (where all the light material, such as bits of paper, etc., are caught and constantly removed for disposal by burying) to a settling tank, where it is made to flow very slowly so as to allow as much sludge as possible to be precipitated. The sludge is emptied out as soon as the tank is nearly full, and is disposed of like the other stuff previously removed. The heavy scum, which rises to the surface while the sewage is passing through, is prevented from flowing on by means of the scum board.

Having been purified as much as possible of solid matter, the liquid now passes to one of the primary tanks. When the tank is full, the sewage is allowed to stand for 1 to 3 hours, according to its state and strength, the time being determined by the man in charge. A skilled foreman can tell by the appearance and smell of the liquid when the right amount of action has taken place. In these primary tanks, though not in the secondary ones, the sewage can be kept too long, whereby it becomes soured and the whole biological action is adversely affected.

The necessary interval having elapsed, the effluent is then allowed to pass through the penstocks into the secondary tanks, where it is retained as long as possible in order to complete the biological action,

due regard being paid of course to the necessity of always having sufficient tank space available to take the next instalment of sewage.

The effluent from these secondary tanks should be up to Thames Conservancy standard* for water from sewage farms flowing into the Thames or its tributaries. However, it is still further treated to make certain of its freedom from pollution. It is first run over a large area of ground sown with rye grass; to produce aeration it is then made to fall over steps constructed of sheets of corrugated iron; and finally it is distributed over another large area of rye grass, eventually flowing through open channels into the river Blackwater.

*Labour.*—It has been found necessary to employ 1 foreman and 2 unskilled labourers all the year round to work the installation and keep it in proper order.

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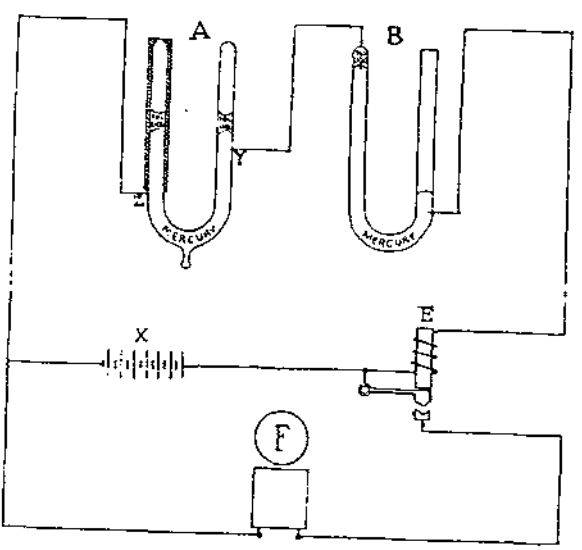
There is a similar installation on the same farm for the barracks at Blackdown, which contain two battalions of Infantry and the headquarters of an Infantry Brigade. In this the tanks are half as large again as those just described.

* The Thames Conservancy Act, 1894, para. 93, lays down that no person is allowed to admit "sewage or any other offensive or injurious matter, whether solid or fluid" into the Thames or any tributary. Sewage is usually taken to mean any water which contains more than 2·5 parts per million of albuminoid ammonia.

# *AN AUTOMATIC FIRE ALARM.*

*By* MAJOR H. HULEATT, R.E.

A VERY ingenious apparatus, called the Autopyrophone, has recently been introduced into this country by the Autopyrophone Co. of Copenhagen. The detector is a double one, one part "A" to detect a sudden outbreak of fire in which the temperature rises rapidly, and the other "B" to give an alarm when the temperature reaches a certain given height, as in the case of a smouldering fire.




The part "A" consists of a U-shaped sealed glass tube about half full of mercury, above which there is a small quantity of volatile liquid in both branches. An electric current passes through the mercury, connection being made by platinum wires passing into both branches of the tube. One branch of the tube is jacketed with a material of low heat conductivity. If the temperature of the room rises suddenly the volatile liquid in the bare branch expands more rapidly than that in the jacketed one; the mercury in the former branch is then depressed below the platinum wire, and the circuit is broken, giving an alarm.

If the rise of temperature is very slow the tube "A" will not act and "B" comes into play. The latter device consists of a U-shaped glass tube half full of mercury, open at one end and closed at the

other. At the top of the closed end there is, above the mercury, a small quantity of liquid of which the boiling point coincides with the temperature at which a call is wished for. When this temperature is reached the liquid will start boiling, the mercury will be driven down by the vapour below the platinum wire, and the circuit will be broken and an alarm given as before.

A test of the apparatus has recently been made by the British Fire Prevention Committee and their report will shortly be published.

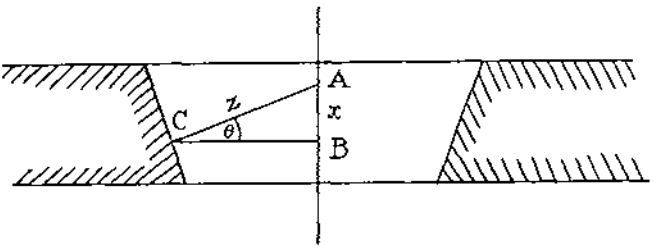
In the diagram A and B are the two parts of the detector, X is the battery, E the Indicator Relay ; one armature of the relay falls when the primary circuit is broken, causing an alarm to be given on the fire call F.

# *CONE CLUTCH DESIGN.*

*By* Capt. J. D. Monro, R.E.

In all petrol motor cars a clutch of some form is provided for rapidly disconnecting the motor from the transmission system. It is usually an ordinary cone clutch, kept in engagement by a spring; but clutches of the expanding ring form are also in use.

The angle of the cone depends upon the coefficient of friction of the materials employed. Cast iron and leather are most generally used; and with these the coefficient of friction may be taken as ·25, and the angle of the cone as 15°.




In the diagram AB is the axis of the clutch shaft. From any point A on the line AB draw AC normal to the face of the clutch, and from C draw CB at right angles to AB. Then $ACB=\theta$ is the angle of the cone.

If AB to scale equals $x$, the axial force pressing the convex part of the clutch into the concave part, then AC to the same scale represents $z$, the resulting pressure perpendicular to the surface of the cone,

and
$$\frac{AC}{AB}=\frac{z}{x}=\frac{1}{\sin\theta}.$$

Therefore
$$z=\frac{x}{\sin\theta}.$$

Now the mean twisting moment M in ft. lbs. in the shaft is

$$M=\frac{33000\,H}{2\pi N},$$

where H is the H.P. transmitted and N the number of revolutions per minute; and if $r$ is the mean radius of the clutch in inches, the twisting force in lbs. to be transmitted by the clutch is

$$\frac{33000\,H}{2\pi N}\times\frac{12}{r}=\frac{63000\,H}{Nr}.$$

So that when the clutch does not slip

$$\frac{63000\ \mathrm{H}}{\mathrm{N}r} = zf$$

where $f$ is the coefficient of friction,

*i.e.*,
$$\mathrm{H} = \frac{\mathrm{N}rzf}{63000} = \frac{\mathrm{N}rfx}{63000 \sin\theta}.$$

Taking $f = \cdot 25$ and $\theta = 15°$, $\sin\theta = \cdot 2588$,

then
$$\mathrm{H} = \frac{\mathrm{N}rx}{65200} \text{ approximately,}$$

and
$$x = \frac{65200\ \mathrm{H}}{\mathrm{N}r}, \quad r = \frac{65200\ \mathrm{H}}{\mathrm{N}x}.$$

For example, if it is required to find the diameter of clutch suitable to transmit 12 H.P. at 1,000 revolutions per minute with a spring pressure of 100 lbs.,

$$r = \frac{65200 \times 12}{1000 \times 100} = 7\cdot 824,$$

whence the diameter is 16 inches nearly.

Or, again, to find the strength of spring required for a clutch 5 inches diameter to transmit 3 H.P. at 2,000 revolutions per minute,

$$x = \frac{65200 \times 3}{2000 \times 5} = 195\cdot 6, \text{ say } 200 \text{ lbs.}$$

The width of the surfaces of the cone depends on the amount of pressure allowed per square inch : this should not exceed 50 lbs.

If W = width of cone surface, the area is $2\pi r\mathrm{W}$ ;

then
$$\mathrm{W} = \frac{z}{2\pi r 50} = \frac{x}{100\pi r \sin\theta} = \frac{\cdot 0123\ x}{r}.$$

In the example above, $x = 200$ lbs., $r = 2\cdot 5$ inches, so

$$\mathrm{W} = \frac{\cdot 0123 \times 200}{2\cdot 5} = \cdot 984, \text{ say } 1 \text{ inch.}$$

# *WITH THE ALLIES IN CHINA, 1900-01.*

*By* CAPT. J. E. E. CRASTER, R.E.

I HAVE been asked to give an account of some of my experiences in China during the operations of 1900 and 1901. It is a difficult and in some ways a delicate undertaking. I kept no diary of my own doings, and the accounts that I received of the experiences of others were generally incomplete and often embellished. It was not easy at the time, and it is now (after three years have elapsed) impossible, to sift the wheat from the chaff.

The best sources of information were not open to me. I cannot, therefore, pretend to write with accuracy of episodes that occurred outside the small circle of my own personal experience. Nor have I the necessary materials at my disposal to enable me to piece together an account of the chief events, which would be complete or reliable enough to pass muster as a history of the Boxer rising.

All that it is possible for me to do is to dwell upon a few minor and (from a historical point of view) unimportant details, the description of which may in some slight measure add interest to the principal incidents, which I must leave to others to chronicle.

It may perhaps be desirable to explain how the Boxer forces were recruited.

The movement was originally directed against the reigning dynasty, the object of the agitation being to terminate the Manchu dominion of China and to place a Chinese Emperor on the throne. It was hoped that the way would thus be cleared for reforms, and that the people would be relieved from the oppression of the mandarins.

The Dowager Empress, however, soon contrived to turn the attention of the Boxers from herself and her court, and to focus it on the universally detested foreigner. That she desired to involve China in a war with Europe is very doubtful.* She probably acquiesced in an attack on the foreign settlements and legations, as it appeared to be the only alternative to her own deposition. She could not dam the flood that threatened her throne, so in self-defence she diverted it.

The prospect of butchering the Europeans and looting their settlements attracted ruffians of every description to the Boxer standards.

* When the European fleets attacked and captured the Taku Forts, she was seized with the strange delusion that Europe was making war on China.

A large number of recruits were found among the crews of the junks trading on the Peho, whose profits had been adversely affected by the opening of the railway to Pekin.*

The Boxer forces as finally constituted comprised;—firstly, a few genuine patriots, who believed that they were fighting for the deliverance of China from the evil spells which the Europeans had cast over their country; secondly, a large number of scoundrels attracted by the prospect of loot; and thirdly, a considerable proportion of honest men, who found it safer to join the Boxers than to remain neutral.

It was the custom of the Boxers to quarter themselves on a group of villages until they had consumed the whole of the food supplies in that district; they would then move on, taking with them the villagers, whose only alternative was to remain behind and starve. Sometimes the latter had no choice in the matter, for the Boxers frequently murdered those who would not join their ranks

The Boxers had a rudimentary form of discipline and were taught a curious drill. Some, with whom we came in contact near Tientsin, were apparently manœuvred with the help of flags and banners, of which they carried a considerable number. If the banners pointed to the front, the line advanced; when they were planted in the ground, the Boxers halted; when they were lowered, the line lay down. It is quite possible that on this point I have mistaken cause for effect, and that the flags were merely used as rallying points.

The Boxers had with them a few mules and ponies, which were used for carrying away the wounded, though probably it was not their original intention to employ them in this way.†

They were armed with Mannlicher, Mauser, Winchester, Remington, Snider and other rifles; they also had smooth-bore muskets and carbines, some bearing the Tower mark. Lastly they had jingals, though these were by no means the least among their firearms. A jingal, sometimes known as a three-man gun, is a fowling piece with a bore of an inch (or thereabouts) and a length of eight or ten feet. It is used, I believe, in peace time as a duck gun, and is mounted in the bow of a sampan or small boat. There are, however, in addition rifled breech-loading jingals, fitted with a Mauser bolt action and using a solid drawn brass cartridge. The jingals that I saw in action were mounted on rickshaws, and from a distance looked very like field guns.

The Boxers' fire was as a rule most effective at the extreme range of their rifles. Presumably they put their sights up to make their

* The burning of a railway station near Pekin was one of the first acts of open hostility on the part of the Boxers. It was the work of these men.

† The Boxers believed themselves to be bullet proof.

rifles hit harder. When within moderate range of the Boxers you might feel tolerably safe in the knowledge that the vast majority of their bullets would go over your head. A muzzle-loading jingal, however, was always a source of anxiety; for, if the powder ran short, its enormous bullet might descend upon you, even though you were comparatively close to the weapon.

Those of the Boxers who had no firearms, carried spears, halberts, swords and banners. The last were triangular, and bore inscriptions or devices. Three good specimens were taken by the Bombay Sappers and Miners near Tientsin. The first was a police station flag from the village of Kau-ja-chung, and had evidently been misappropriated by the Boxers; the second had the word "Assistance" emblazoned on it in Chinese character; the third had a well-known Chinese device, which is supposed to ward off the evil eye and was, I believe, in this case intended to render the bearer bullet proof; the flag is stained with the blood of the man who carried it.

The Boxers whom I saw wore no special dress or distinguishing mark, but there was one old man among them who appeared to be wearing a large red wig. He did not wait for us to investigate further.

It is not easy to say how far the movements of the Boxers, or indeed of the Chinese regular troops, were controlled from Pekin. The Boxers were at best an unruly crowd, and the Imperial soldiers were not much better. The following version of the Chinese plan of campaign was at one time current in Tientsin, and obtained a certain amount of credence, although I do not believe it found acceptance in official circles.

The Chinese, so the report went, decided to make their great effort at Tientsin. Every soldier who was within reach, and every gun that could be hauled across country, were to be employed in driving the Europeans out of the Tientsin Concessions.*

Victory at Tientsin was to be the signal for a rising against the

* The Concessions form the European town of Tientsin, and are situated some one and a-half miles from the native city. The fighting at Tientsin was severe. The French Concession, which bore the brunt of the Chinese bombardment, was wrecked, and considerable damage was done to the British Concession also. The railway station—an isolated post on the far bank of the river—was so riddled with shot and shell that it was difficult to understand how the garrison had contrived to hold it and survive. The severity of this fighting and the magnitude of the stakes at issue were, I think, never appreciated in England. The newspaper correspondents came out later. Even in official circles, if I may be permitted to say so, the gallant defence of Tientsin has received little recognition. The relief of the Pekin legations was dramatic; the defence of Tientsin was, as far as I could learn from those who had been present at both, a far more difficult and costly feat of arms. I hasten to add that I personally was not present at the defence of Tientsin.

foreigners throughout China; even the Pekin legations were to be preserved until after the fall of Tientsin.

The Shantung Viceroy had with him at the time a large body of troops—some said 100,000. These had been trained by Europeans, and were armed with Mannlicher rifles and modern field guns; they were, in short, the most formidable army in China.

The Viceroy, so the story went, received orders from Pekin to march on Tientsin and assist the Chinese generals who were already engaged in an attack on the Concessions. He started, as in duty bound; and had gone some considerable distance when he received news that the foreigners, instead of being driven out of the Concessions, had captured the Tientsin native city. After that he halted for several days to consider the matter, and finally returned to Shantung, suppressing the Boxers on his way.

I give this story for what it is worth. I have no certain knowledge that it contains one grain of truth. It is interesting chiefly in view of what might have happened if the Shantung Viceroy had actually attacked with his large army. He would probably have arrived at Tientsin soon after the relief column had set out for Pekin, and when, consequently, the former town was held by a very small garrison. There is little doubt that he might then have captured Tientsin, or at least have effectually isolated it, both from Pekin and Taku.

The resulting situation would have been a curious one:—Pekin, the capital of China, in the hands of the Allies, and Tientsin, the Allies' advanced base, in the hands of the Chinese. There would, in fact, have been every prospect of as pretty a campaign as any general could wish to avoid.

These are, however, idle speculations. I have given a short description of our enemies, the Boxers, so now let us turn to our allies.

The first point that impressed me, was the extreme readiness of the European soldier to let off his rifle; he seemed to prefer to shoot at nothing rather than not to shoot at all. The sentries furnished by the freshly landed European troops nearly always contrived to fire several rounds each night, even though they were posted well inside the Tientsin defences, sometimes even in the heart of the town.

We were subjected to a most unpleasant form of this night-firing nuisance on New Year's Eve, when each of the sentries of one of the contingents saluted the New Year with three shots. They should of course have been blank rounds, but apparently the majority were ball. The number of bullets that came over the West Village, in which some of our troops were quartered, was so great that our troops stood to arms. If the firing directed towards the other points of the compass was as heavy,—and why should we suppose that the said sentries pointed their rifles in our direction more than in any other,—there must next morning have been a considerable deficiency of ball ammunition among the troops of that contingent.

One night, when I was encamped with a small detachment on the banks of the Peho, our camp was fired into by a European soldier on a passing junk. The junk was near enough for us to hear the man talking, but it was so dark that he could not have seen the camp and must merely have fired at a light outside my tent. I could give several other instances of the reckless way in which our allies wasted their ammunition.

In India ammunition has a marked tendency to gravitate towards the frontier; consequently a strict account must be kept of every round, and a sepoy who mislays one or two is likely to be tried by Court-Martial. The direct result of this vigilance was shown in the reluctance of the sepoy sentry to fire, even under the greatest provocation. This forbearance was, I fear, attributed by some of our allies to cowardice; but cowardice or forbearance, some of them owed their lives to the quality.

I think we awaited the arrival of the German troops with more interest than we devoted to our other allies. The German army had always been held up to us as the ideal at which we should aim, and consequently we hoped to learn a good deal from closer acquaintance with it.

Their contingent had no efficient means of locomotion, having landed in China with practically no transport. They had some large waggons, the wheel track of which was too broad for any Chinese country road. Also they had bought, at a high price, a large number of Australian horses, the majority of which did not survive long, as they had just got rid of their winter coats in preparation for the Australian summer and rapidly succumbed to neglect and the rigours of a Chinese winter.

The soldiers themselves were well set-up, sturdy men; picked troops, by the look of them. They suffered a good deal from enteric. This was no doubt partly due to the fact that the men were young and unseasoned; but was also attributable, I think, to lack of sanitation and to eating Chinese food. The other European troops in China seemed to be practically free from the disease. The German barracks were crowded to an extent that would not be allowed by our medical authorities. In some rooms the men slept in bunks arranged in three tiers.

The discipline of the German troops was strict, and their close order drill excellent.

They arrived in China dressed in khaki, and wearing soft straw hats looped up at one side. Unfortunately the khaki would not wash, and the straw hats soon shed their brims. I heard that about this time one or two English manufacturers of cork helmets made their fortunes. The helmet adopted by the German troops was a strange khaki contrivance with a hinged flap at the back, which could be turned up out of the way when the soldier lay down to fire. Some-

times the flap turned up quite quietly and of its own accord. The object of covering the helmet with khaki was soon forgotten, and before long it was ornamented with a brass eagle in front, and coloured ribbons round the *puggaree* to denote the wearer's regiment.

The organization of their scientific corps was the very opposite of ours. The German pioneers correspond to our field companies; their work, however, is limited to field trenches, demolitions and pontooning. Their railway battalions and telegraph battalions constitute altogether separate and distinct services. Their engineering branches are, in fact, kept in hermetrically sealed compartments. There is a lack of any central authority, corresponding to our C.R.E., who can ensure co-operation between the various corps.

The result was as follows. When the Germans were repairing the railway and constructing their telegraph lines, the work made comparatively slow progress, and both the railway and telegraph troops were overworked; but at the same time their pioneers were doing barrack-square drill and gymnastics, to keep the men fit.

We had three field companies and a balloon section, which were employed with their officers at various times on railways, telegraphs, hutting and fortifications. We had in addition a weak telegraph section and a skeleton railway section, but neither would have been able to get their work done unless they had been reinforced from the field companies.

The separate compartment system, as exemplified by the German organization, is one that cannot be recommended. The Indian R.E. organization stood the test of the campaign extremely well; no doubt it is not perfect, but it is far preferable to the German system.

It may be of interest to note that the German officers in China received fifteen marks a day over and above their ordinary pay, and also a certain amount in the way of free rations, etc.

The French, who were in North China in the earlier operations, were chiefly Colonial troops, including members of the Corps Disciplinaire. They looked unfit and fever stricken. They were dressed in blue cotton uniforms with white helmets, over which they wore a blue cover.

The regiments which came direct from France were of two distinct types. There was one, raised from the Paris garrison for service in China, composed of very small men of poor physique. The Zouaves, on the other hand, though small were very muscular and thick set; they appeared to be older men than their comrades from Paris, and were in my opinion some of the best European troops in China. The Chasseurs d'Afrique, mounted on barbs, were very good specimens of light cavalry.

The French staff work appeared to be very good. Their troops moved about from place to place without any fuss, and usually without their departure being anticipated by their allies. Along all the roads

the French maintained sign posts, which not only gave the distance of the next station, but also information as to short cuts that could be taken in dry weather, and their suitability for wheeled traffic.

We saw very little of the French engineers, but a good deal of their handiwork. If ever you meet a French engineer, take off your hat to him, for he is an artist. Their work, especially as exemplified in their bridges, was excellent. Their floating bridges were always in good repair, whereas bridges made by the other nations were soon allowed to degenerate into forlorn clusters of half-sunken junks.

Many of the French engineers were artillery officers. The explanation of this anomaly is that artillery officers are all put through the same course as those of engineers; in the absence of an engineer officer, they are held responsible for the execution of engineer works, and therefore take command of any sappers who may be present at the station or post. One artillery officer informed me that he had been employed for several years in building barracks in Cochin China.

I believe I am right in saying that the French Artillery, as such, favourably impressed our own artillery officers.

The French troops were very quick to adapt themselves to the conditions of the country. They used the Chinese rice cauldrons for cooking their food, and often had their dinners ready before our troops had made out their ration indents. I asked a French officer at what hour his men usually had their dinners. He replied: "When I am satisfied that they have finished their work." *Verb. Sap.*

The French transport was well organized. They had a fleet of junks for the river, a cart corps and a camel corps for the roads. Their carts were of two types, both two-wheeled; the wheels being in each case made of some light composition—*papier maché* I think—very large and broad in the rim. The body of the first type of cart consisted simply of a wooden grating resting on the axle. The second type had a bent steel axle; the bottom was galvanized iron, and the sides iron lattice work. These carts each had a Chinese driver, and were drawn by one or two mules. The French camel corps was composed of camels from Central Asia, which arrive at Pekin in large numbers in the winter; the drivers, who I suppose were also the owners, were Chinese or Mongols.

This article has already extended beyond the limits that I originally intended for it, so I find that I have no space for a description of our other allies or of our friends the Americans. As regards our own troops and their organization, I do not wish it to be supposed that absence of criticism implies the absence of defects.

## *STATUES.*

*By* CONCORDIA.

IN the absorbing study of human life, and what must and what may happen to man, one thing in the very nature of things appears to be a certainty, judging by what has gone before, and that is that statues will still continue to be made.

We do not know who it was that first made a statue of a man, but think it was the Egyptians who originally entered into the business, and they commenced the art at a very remote period.

Palæolithic men, so far as can be traced, made no statues or graven images of a durable nature, the tools of the period Circa 60,000 B.C.—10,000 B.C. being quite incapable of use for the purpose required.

But then came the new age, when the so-called neolithic men, of geologically speaking modern times, as a substitute for statues to the individual hunter, reared aloft their mighty temple of Stonehenge; a central monumental structure in memory of the great departed, and to the worship of an infinite power; Stonehenge with its huge horseshoes of majestic trilithons, a polished gem amidst a setting of rough, uncut and fractured stones, standing out against the eastern horizon at the rising of the midsummer sun. So it stands, simplest and most dignified of memorials, as an earnest reminder to us that our prehistoric ancestors could build, not for a passing moment only but for an age in point of time.

Neolithic man did not, however, seek to perpetuate in stone, only for a brief span, the mere corporeal carcase of the individual man, but raised up a magnificent national memorial, symbolical of the combined virtues of the great ones gone before, and to the glory and immutability of the power they worshipped, an infinitely long space of time and an infinitely great amount of patient labour on the part of the living being expended in the course of the work.

As for personal statues made for showing off in a public place, we know that they were made more than 2,000 years ago, and are still being made; those people who could not get good statues had to be content, as we now are, with bad ones.

As civilization began to dawn, with its accompanying egotistical ideas, many statues of their gods and kings were made by the Egyptians. Some of these statues possibly bore some resemblance to the originals; many of them were colossal, constructed of very smooth stones; but the attitudes were awkward and stiff, and

certainly did not always represent the beauty of the human form divine.

The Greeks, following on, began by making statues of their deities, who fortunately for art were represented by men and women. Then by degrees they commenced on national heroes, statesmen, soldiers and poets.

Cicero mentions a statue being put up to the memory of a great poet some centuries after his decease. This statue was made to replace another in honour of somebody else whom nobody living had heard of or ever cared to hear much about. He describes the statue as the figure of an old man, bent with age, with a book in one hand. In the statue, the bald, stooping, old poet is represented as leaning on a strong staff, reading a roll, and well employed. He was probably engaged in reading a good book, perhaps his own poems, and so we feel no concern for him, knowing that he will never be tired.

How different to some of the present-day statues, where we see a man standing for ever on his legs in a public place, doing nothing but stand, and seeming as if he were never going to do anything else. One would rather see a living man standing on an inverted beer barrel than the mere effigy of a man standing on a stone pedestal, for the living man expresses something, the stone man expresses nothing.

When the Greeks did begin to set up statues they went on at a great rate. Philippus of Croton, who fell in battle in Sicily, said to be the comeliest of all the Greeks of his age, was immortalized by the people of Segeste, who built up an heroum or monument over his burial place where sacrifices were offered up to him.

The Romans followed the Greeks, and we follow the Romans.

Such was the rage for statues amongst the Romans that prominent men and others had their own effigies erected in public during their lifetime. Such also was their bad taste at times, that they even dressed themselves for the occasion in Greek costume. Scipio, who conquered Antiochus the Great, was placed in the Roman capitol got up in a Greek dress and in Greek footgear.

Curiously, or consequentially as the case may be, some of our truly British statues follow suit, the statesman or poet being enwrapped in a blanketlike robe, which those of artistic temperament might call a Roman toga. Either let us set up our heroes stark naked, or dress them in a suitable costume as decent British gentlemen. The Romans put up a naked statue to the great Admiral Agrippa, but the statue was colossal and Agrippa was a deified hero. Britannia's naval god of war is perched up on the top of a lofty celestial pillar, as far away out of the public ken as possible.

What is the reason that so many people in London pass our statues continually, and do not pause to look at them? Is it because familiarity breeds contempt, or because some of our statues are so

black and ugly? To most of these people it matters not a jot what an outdoor statue is like; they can do very well without it, and if it must be had, they are easily satisfied.

The Romans were sometimes wont to gild their bronze statues. Nero ordered an Alexander by Lysippus to be so treated, but it was found that the beauty of the work was spoiled in the process, and the gilt was removed. Lysippus, who knew his art well, used to say "other sculptors make men just as they are, but I make them as they seem to me." In his bronze statue of Alexander he depicted him carrying a spear in his hand, and with his face looking up, which indeed was the king's fashion, as he always carried his neck a little on one side. The inscription on this statue is an appropriate one—

> "Looking to Zeus, the bronze appears to say,
> I made the earth, keep thou Olympus."

A seated black statue in the open air is not to be commended. Our London statues of Cartwright looking like an old cobbler on his stool, and that of Fox, worse treated still, blanket dressed, fat and black, are patent examples. Is it to be wondered at that on a recent occasion one of our transatlantic cousins mistook the latter for a negress, the emblem of British philanthropy, and a memorial of the abolition of slavery?

The Greeks were the first people to mount their statues on various types of animals. Europa was seated on a bull, Aphrodite on a bronze he-goat. One of the most beautiful specimens of their antient art was a woman seated on a species of tiger, with one hand on his neck, the other grasping a thyrsus. She sits upright, bare to the waist; her drapery is well secured round her middle and, hanging down, leaves her feet free. The beast is galloping at a great rate, but the woman is so firmly seated that there is no fear of her coming off.

The usual beasts on which we mount our heroes have been horses. Nor is there considered to be much beauty in a horse standing still, with a man's legs dangling tamely from the beast's back; neither is the matter mended by both horse and rider being of colossal size. It is however a consolation that these statues must by the nature of the case be rare; and it is most fortunate that we see little of them except at a distance, which is really the best position from which to view them.

Zenodorus, a great Greek sculptor, was noted for the size of his work, one of his commissions from the reigning Emperor Nero being for a statue of his imperial majesty 110 feet in height—and he made it. Zenodorus beat all his predecessors in this respect.

Women from time immemorial appear to have been very scantily treated in regard to statues, the idea being that all women were fully entitled to a statue at home, if only they were willing to pay for it. The Romans were more generous than were the Greeks,

sometimes placing their statues of women in the open, and occasionally on horseback. The Roman girl, a hostage in the Tuscan camp, who escaped by swimming across the Tiber, was immortalized by an equestrian statue erected on the top of the Viâ Sacra. Cornelia, the daughter of the conqueror of Hannibal, and the mother of two reforming sons, who, by the way, suffered the usual fate of reformers, had a bronze statue set up to her with inscription "To Cornelia, the mother of the Gracchi."

Has not England ever produced a woman, other than a queen, worthy to be honoured in bronze or even in stone at the public cost? The French have their Jeanne d'Arc, burnt alive by the English, and Jeanne will never be forgotten! We might perhaps find such a one without much difficulty, not a fighting woman perhaps, but one who was the equal of Jeanne in courage and had possibly a good deal more common sense.

Those ladies amongst the Greeks who did attain the distinction of a statue were more often noted for other things than careful housekeeping. Praxiteles made a statue of the beautiful Phryne in marble, with a replica in gilt which was readily and speedily disposed of by Phryne, who despatched the same to Delphi, the Salvation Army headquarters of the times. Silanion, the Athenian, made a statue of the Lesbian Sappho, the Syracusan, some centuries after her death, but Verres, the Governor of Sicily, well known as the greatest thief on record, fell in love with it and carried it off. The statue has now perished, but the fame of Sappho lives in her own immortal verse.

As we have always been a fighting people, so have we been great makers of statues of fighting men. But as a rule these statues have been so tame and lifeless that we only know them to be fighting men by their dress. Why do we not also make statues of our athletes,—boxers and wrestlers, riders, cricket players, footballers, marksmen and motor-car racing champions.

Lysippus made statues of both kings and boxers. He it was who made the famous statue at Olympia of Polydamas, the biggest and strongest man that had appeared since the days of Hercules. Polydamas was the one man who had, unarmed, killed a lion, whose tracks he crossed when wandering in the forests of Olympus; but unlike Hercules, who in his historic encounter with a wiry ancestor of this noble beast was armed with a club, Polydamas had no weapon.

It appears to be singular, or otherwise as the case may be, that we, who as a nation pride ourselves on our prowess in all bodily exercises more so than any other modern nation save perhaps the Japanese, have not used our sculptors to immortalize our athletic heroes. There is authority for the treatment of such subjects, such as representing a boxer in a fighting attitude, even if he be not actually bruising another. A place such as a Pantheon would be required for

depositing these statues in, for it would be clearly inadmissible for them to be welcomed inside our churches, which are exclusively reserved for those fighting men who have fought in their country's cause.

The time may yet come when we shall find some way of making statues of cheaper material than metal. Perhaps we shall make them of paper! That will indeed be a truly glorious time! Then we may all have our own statues, living or dead; and what is better, we shall not then be plagued with those periodical demands for subscriptions to statues of men whom we never saw and do not much remember about.

If there are men now living, looking forward to the honour (if it is an honour) of being set up in bronze in the public highways or in marble in some covered-in building, if it be permissible to advise, we would humbly say "Leave a legacy in your will for your own statue." It will save much trouble, and people will think all the better of you when you are gone if you cost them nothing. As to their laughing at you for looking after your own effigy, be not afraid. There is good classical authority for providing by will for your own monument; and if a man does really expect or fear that he must after death stand before the British public to be gazed at and rained on, he will best leave matters to his executor, paying the artist well, and thus escape the taste of a committee.

The Romans when they set up a public statue acted as follows:—Servius Sulpicius, a great man, died on duty. His friend Scipio pronounced a panegyric in the senate, and moved that a bronze statue of Servius be placed on the Rostra, no special sum of money being mentioned. The consuls were then empowered to instruct the treasury to make the contract and pay the artist. When the right artist had been found, they allowed him to have his own way, and did not higgle about the statue, pedestal or funds.

With regard to statues, as in all things, so in this there are degrees. Some men have been imbronzed during their lifetime, and have actually seen themselves bestriding horses, brazen men on brazen beasts. But this is rare. Other men wait until they are dead, and enjoy the statue by anticipation, being comforted by the prospect of their immortality in bronze, marble, or even freestone.

Some men may be content with a marble bust, which they may get in their lifetime, either by hiring a man to make it or by the kind attention of friends. Indeed we have only to go to a well-known glass house near the Metropolis, to see in rows, placed side by side, plaster busts of the illustrious dead aligned with those of some of the not illustrious living. But it is hard to understand how these busts found their way there, unless sent in by the living originals, the general conclusion being that many of them were not placed there for their beauty, and that others were inserted so that vacant

pedestals might be filled up; these latter may in time have to make way for other heads that may perhaps have something in them. In the meanwhile we will take it for granted that any face is welcome there, so long as there is room for more.

A striking example of statuesque, up to date, architecture may now be seen in the vicinity of High Holborn, where a newly-constructed large financial house is surcingled by a string course of plaques, adorned by the trunkless heads of great statesmen, engineers, musicians and artists, financial magnates and military engineers being conspicuous by their absence.

Now recapitulating, as far as can be gathered the Egyptians first commenced the art of personal public statue construction, of their gods and kings; the Greeks followed suit with statues to genuine heroes, such heroes as in modern times would almost be made saints; the Romans amplified the numbers of those deserving statues, and we have followed the Romans; but the end is not yet.

"When you and I behind the veil are past,
Oh, but the long, long while the world shall last,
Which of our coming and departure heeds
As the sea's self should heed a pebble-cast.

"Why, if the soul can fling the Dust aside,
And naked on the Air of Heaven ride,
Were't not a Shame,—were't not a Shame for him
In this clay carcase crippled to abide."

Therefore why build public statues at huge cost for our own departed men of renown and daring, and place them in positions where they may be criticized by a scoffing public not in touch with the spirit of a bygone age. Rather let us build a private valhalla or museum, call it what you will, on our own precincts and fill it with memorials expressive of the soul, mind and character of those we seek to honour. A fine portrait, or a miniature procurable at a fraction of the cost of a so-called indestructible statue, will convey more than an image in metal or in stone to the comparatively few generations who have come under the spell of the great ones lost to view. This valhalla will take the place now filled by the family portrait galleries, the pride and interest of so many of the antient homes of England; or will form a haven of rest, sacred to the members of whatever great corps it represents, open to the private view only of the living and their friends, and not approachable to the self-satisfied and unsympathetic section of the vulgar unpatriotic public.

# *TRANSLATIONS.*

## MOTOR BATTERIES FOR FORTRESS WARFARE.*

(*From the* MILITÄR WOCHENBLÄTT, *3rd November*, 1904).

That motor cars will have a very important part to play in the war of the future is scarcely open to doubt in view of the extensive employment that has been made of them in the more important autumn manœuvres of all armies, both for the conveyance of the superior officers of the Staff and for the transmission of orders to a distance. Attempts to transport heavy loads by motor wagons are less well known, though there can be no doubt that, with the increased size of modern armies, this method of forwarding supplies, etc., forms an equally important field for their employment. Realizing this, the Prussian Ministries of War and of Agriculture offered a prize in 1902 for the construction of a motor wagon, driven by spirit, which was to draw a load of 15 tons† along a good road at an average speed of 3 miles per hour and 43 miles per diem and at the same time be able to negotiate gradients of 1 in 10.

The supply of such wagons would be of special importance for fortress warfare. Whether experiments on a large scale for the transport of guns and ammunition have been made in any other country, and with what success, is not known. It is all the more interesting to hear that such experiments have recently been made in Portugal, apparently with great success. The order for this was due to a suggestion by Colonel of Engineers du Bocage, upon which the Portuguese Government ordered a battery of four 6-inch howitzers from the gun factory of Schneider & Co. at Creuzot. This battery with its ammunition is drawn by *one* traction engine, and is intended for the defence of Lisbon.

The traction engine (or motor wagon)—built on the Brillié system—weighs 7 tons, and is capable of carrying a useful load of 5 tons (ammunition, equipment and men) besides drawing four 6-inch howitzers, weighing in all 14 tons, on roads having a maximum gradient of 1 in 12.5. With steeper gradients, up to 1 in 8, the traction engine ascends alone, unwinding a strong wire rope from a drum; its wheels are then scotched up, and the howitzers are wound in.‡ It is possible to regulate the speed according to the condition of the roads and the amount of the load

* Communicated by the Chief of the General Staff.

† The various dimensions and weights in this article have been reduced to the nearest English equivalents.

‡ In an experiment, where three howitzers were attached, gradients of 1 in 5 were surmounted, of course with the aid of the rope drum.

*i.e.*, to 1·5, 3·28, 5·8, 8·8 English miles per hour. The supply of water and fuel (benzine, alcohol or petrol) is calculated for a distance of 50 miles; but there is no difficulty in carrying a larger supply in cans. The total load drawn is thus 26 tons, for which at least 50* horses would be required. But inasmuch as a day's journey for horses is about 15 to 18 miles, while the traction engine can easily do 40 to 50 miles, it follows that the latter is equivalent to at least 100 horses. In addition a considerable saving in attendance is effected.

The wagon itself carries 64 shells. The design includes a separate ammunition train consisting of four ammunition wagons, each of which carries 40 shells, and their motor wagon also carries 64 shells. Thus these two trains carry 288 rounds, 72 for each howitzer, and they occupy on a road a length of not quite 65 yards.

The howitzer, constructed by Schneider-Canet, is a quick-firing weapon with long barrel recoil, similar to the older types of this factory, and has therefore a great likeness to the French 75mm. (=3-inch) field gun M/97. In the firing position it weighs 65½ cwt., and it fires a shell weighing 88 lbs., with an initial velocity of 1,150 ft. and a maximum range of 8,720 yds. For firing the howitzer is placed with its wheels and the point of the trail, which has a folding spur, on planks; but in case of need it can also be fired from the natural ground without intermediate support. Special means for fixing, as provided for the French field gun, are in this case unnecessary. If minor changes of position are required, a small wheel is inserted in place of the spur, and this considerably facilitates the move, especially with the aid of the rope drum.

At the point of the trail a limbering ring is provided by means of which the leading howitzer is connected to the motor, the second howitzer to the leading one, and so on. For this purpose an appliance is fixed to the muzzle end of each gun-carriage, to enable the limbering ring of the succeeding howitzer to be attached thereto.

The howitzer has an appliance by means of which the barrel can be rapidly changed from the firing position to the horizontal loading position, or *vice versâ*. In place of a "collimateur" it has a telescopic sight, which is secured to the shield pins on the cradle.

If hostile fortresses in future warfare are not to cause undue delay to the advance of a field army, it is essential to confront them with heavy guns as rapidly as possible. This is one of the most important lessons taught by the Franco-German War, and all nations have accordingly made provision for the horsing of heavy batteries, which follow the field army at a certain distance. Part of these batteries will under certain circumstances be in immediate touch with the field army, as they may have to take part in its battles. For such batteries it will for some time to come be impracticable to replace animal by mechanical haulage. With the remaining (*i.e.*, mortar) batteries, however, horses could with advantage be replaced by traction engines. Possibly their first cost will be greater than that of horses, but certainly the cost of maintenance will be less. Had we possessed only about twenty such traction engines in

* The motor has an indicated horse-power of 35.

1870 before Paris, the ammunition necessary for bombardment, the total weight of which was estimated by Lieut.-General von Müller at 1,425 tons, could undoubtedly have been transported in 30 days from Nanteuil sur Marne to the Park of Villacoublay (a distance of 18 miles). In that case the bombardment of Paris could have commenced nearly two months sooner.

Such traction engines would be of far greater service in the defence than in the attack of fortresses. They would considerably reduce, if not entirely obviate, the necessity for the slow process of laying narrow-gauge railways. By this means also a freer choice could be made of the roads of approach; and portions exposed to fire could more easily be avoided, as such traction engines, especially if of light construction, can very well travel across country, a fact that has been proved by the train built by the "Allgemeine Elektrizitätogesellschaft" to the order of Lieut. Troost for the troops of occupation in S.W. Africa. Above all they enable the requirements in horses and men to be considerably reduced, which is of special importance inside a fortress. It would seem very desirable to provide such traction engines in peace time for all the more important fortresses, to take the place of cart horses and to serve for the training of a certain number of drivers. It is needless to say that this should not be done until extensive trials have first been made.

# SANITATION IN CAMPS.*

In the *Journal of the Royal Army Medical Corps* for November last appeared two articles,—*The Causation of Enteric Fever at Quetta*, by Lieut.-Colonel J. Battersby, R.A.M.C., and *Water Supply and Sanitation in India*, by Lieut.-Colonel H. S. McGill, R.A.M.C.—which contain much information that is valuable to officers responsible for the selection of camping grounds and for the sanitary measures to be adopted on their occupation; the necessity for such measures "is too often undervalued by military officers, both during peace manœuvres and on field service."

The articles should be read *in extenso*, but the following extracts may be found useful; to save space the usual omission marks are not given.

## Conservancy in Camps.

In February, 1899, Colonel Battersby was ordered to Quetta as Special Sanitary Officer. "The previous year had been particularly unhealthy, as (with an average strength of 2,543) 232 cases of enteric fever had occurred amongst the European troops, with seventy-five deaths, the virulence of the disease being most marked during the usual period of seasonal prevalance, July to November. The cause of this outbreak was very thoroughly investigated, and was found to be undoubtedly due to the position of the old trenching grounds, which were situated to the windward of the barracks, about a mile to the north-west of the cantonments. The system of shallow trenches for the disposal of night-soil was wholly unsuitable for Baluchistan, where the average annual rainfall is about twelve inches. When the annual dust-storms commenced in May and June (more especially the so-called 'dust devils'), clouds of dust-borne germs must have been blown over the cantonments, inevitably infecting water, milk, and all articles of food and drink exposed to air and dust, as the prevailing wind blew directly from the trenching grounds towards the barracks.

At this time the Royal Artillery and left British Infantry lines were nearer to these shallow trenching grounds than the right British Infantry barracks, and were placed more directly in the line of wind which carried clouds of germs from these dried-up and dusty trenching places. In the eight years prior to 1899, 114 deaths from enteric fever occurred in the Royal Artillery and left British Infantry lines; while 32 deaths were registered from the right British Infantry barracks.

Lieutenant-Colonel Davies, R.A.M.C., the Sanitary Officer at head-quarters, stated: 'I feel convinced that this (infection contained in the air) has been the principal channel of its conveyance, and that the main

* By permission of the Editor of the *Journal of the R.A.M.C.*

source of the poison was the filth trenches, though latrines, Native and European, may have been concerned as well; the cessation of cultivation of the trench area, combined with the absence of rain in 1898, has, in my opinion, established the fact of aerial infection.' It seems unnecessary to remark that the system and the site previously adopted for the disposal of night-soil were at once changed. The infected area and shallow trenching grounds were, as far as possible, cultivated, and where this could not be accomplished, the dry and dusty surface of the ground was covered with litter, which was then burned, and every additional endeavour was made to destroy the *materies morbi* of the disease.

A new system of deep pits was introduced, and was found to answer admirably, pending the introduction of a water-carriage system and septic tank installation. The present site (at Sahabzada) for the deep pits is situated about three miles to the north-east of the British Infantry barracks, a point from which the wind seldom, if ever, blows towards the cantonments, and is approached by a good metalled cart-road. Each pit is 30 feet in length, 11 feet deep, and 7 feet in width, and receives all the night-soil (solid and liquid) of the cantonments for six days. The pit is filled up to 18 inches from the surface. A series of similar pits in line with each other are dug, each pit being separated from its fellow by a wall of clay about 2 feet thick, on the top of which a drain is cut 2 feet wide and 9 inches deep, which allows every possible overflow during wet weather to be discharged into the adjoining pit, and thus preserves the surface of the ground from pollution. These pits act as anaerobic chambers, as the surface of the contents is quickly covered with a thick scum of leathery consistence. Bacteriological action quickly reduces the solids to a liquid condition, while the hardy putrefactive organisms rapidly destroy the more delicate pathogenic ones. The latter are accordingly trapped, so to speak, in these pits, instead of being allowed to play their mischievous *rôle* in dry dust and shallow trenches. Besides, various gases are being continuously formed, which escape freely into the air. By this constant bacteriological and chemical action the contents of each pit practically disappear within a year, when the pits can again be used. A special conservancy establishment is located at these pits. A good supply of pipe water has been laid on, and from six standposts all the receptacles and Crowley carts are thoroughly washed before returning to the cantonments. This washing is done on a brick and cement floor, and the dirty water conveyed by a surface drain to cultivated land.

Notwithstanding the many sanitary alterations and improvements that had been effected during the previous two years, another outbreak of enteric occurred in 1900. This outbreak, unlike its predecessors, did not make its first appearance in barracks, but in camp. As a prophylactic measure, summer camps had been formed for young soldiers; one for Infantry was situated in a remote district, far removed from native villages, and provided with an excellent pure water supply; the other, for Royal Garrison Artillery, was chosen by the authorities as affording the best site for practice, being situated at a convenient distance from the artillery range. This camp was near Baleli, in the Bostan Valley, and here enteric fever began in the month of July. After the third or fourth

case had occurred the camp was moved to a new site at a distance of two miles from the former. The water supply was above suspicion, and was obtained from an artesian well of 120 feet in depth; still the disease continued to spread. A noticeable feature of both these artillery camps was the marked prevalence of dust-storms and 'dust devils,' which daily blew into the tents. The season (June, July and August) was reported to be an unhealthy one amongst the natives, and on visiting the surrounding villages we found many Pathans and their children suffering from a form of fever indistinguishable from ordinary enteric. Here, then, was a possible solution of the problem, as owing to habits and customs inseparable from the native population, the dusty soil and streams of water adjoining their dwellings must have formed sources of actual infection. The dust from these villages must have been charged with enteric and other germs, as everywhere it was visible, mixed with dried fragments of fæcal *débris*. The conclusion was therefore forced upon us that it was from such sources of infection that the disease spread to European troops by means of aerial convection. A marked feature of the outbreak in camp was the apparent tendency to spread from one individual to another, more especially amongst those occupying the same tent. This seemed to be due to personal contact and direct infection from man to man, and probably to indirect infection through contaminated clothing, bedding, soil, or possibly by flies. In a dusty country the enteric bacilli are widely disseminated by the wind, infecting articles of food and drink, which, under the conditions of camp life, are necessarily more exposed to such infection. The common fly should also be regarded as a constant source of danger, through depositing bacilli from bed-pans, urinals, latrines, filth carts, shallow trenches, polluted ground, or articles of clothing soiled with infected urine or fæces. In camp, flies are ubiquitous and swoop down upon every article of food and drink exposed to their view. Unwashed raw vegetables, or fruits and vegetables washed in the wayside stream, must be looked upon with grave suspicion. The native bazaars are also most undesirable places of resort. There is grave suspicion that some of the cases occurring in barracks owed their origin to mineral waters from eating houses, where pollution might possibly have occurred through leaky water pipes. The common hawker, too, should be prohibited from selling his goods in camp or barracks.

With the experience of the artillery camp of 1900 fresh in our memories, we resolved to search for a new camping ground for the enteric season of 1901. About seventeen miles from Quetta a good site was discovered, remote from native villages, and provided with a sufficient water supply of excellent quality; although malarial fevers of a mild type were prevalent, enteric fever was conspicuous by its absence. In 1902 another summer camp was chosen at Mangal-Kot-Kotal, situated at a distance of twenty-four miles from Quetta, and also remote from villages. The water supply was excellent, and conveyed by means of 2-inch pipes from an adjacent mountain spring. Not a single case of enteric fever occurred. The men for these camps were specially selected, bearing in mind the predisposing influences of youth and of recent arrival

in the country, as the period of greatest liability to attack for men is undoubtedly between 20 and 25 years of age.

These summer camps were not popular with either officers or men. The beneficial effects, however, were so marked in diminishing the number of admissions to hospital from enteric fever, that it was decided to search for a more popular site for the summer of 1903. About sixty miles from Quetta lies the pleasant hill station of Ziarat, situated at an elevation of nearly 8,000 feet, and about two miles distant was an excellent water supply, known as 'Lady Sandeman's tangi.' The site was sanctioned for one season as an experiment, and orders received to prepare a camp for 1,200 European troops, with the usual complement of followers and transport animals. The Sappers at once prepared an excellent road about two miles long, connecting the main road with the highest point of the camp, which was also divided longitudinally and across by two broad roads. Separate sites were now measured for half a battalion of each Regiment, and for the Garrison Artillery and Mountain Battery. In doing this, strict orders were issued that no trees were to be cut down, and that the tents were to be pitched between the juniper trees wherever most shade was afforded. I arranged that all night-soil should be removed by Crowley carts and deposited in deep pits, as we were doing at Quetta. For this most important purpose a suitable site was at once selected to the leeward of the camp, about a mile away. Sites for company and native latrines and urinals were also marked out, each latrine and urinal being supplied with a double set of glazed earthenware receptacles. No trenching whatever was allowed, and on the arrival of the troops, with their native followers, all conservancy arrangements were ready for immediate use. If these preparations are not made prior to the arrival of troops in camp the surroundings will inevitably become polluted. The adoption of the removal system for night-soil in camp enables the site to be handed over after three or four months in as clean and sanitary a condition as when first occupied.

Cook-house water should be regarded as sewage and removed to separate deep pits. Special Crowley carts and receptacles for the removal of cook-house water are reserved for this purpose and painted white. Ordinary washing water can be used for watering the plants and trees outside the camp. One or two small incinerators should be provided in suitable positions and all camp refuse burned in them. I have found an iron frame, somewhat similar to that used for the protection of young trees, with a grating near the ground, to act admirably for such purposes.*

* A subsequent number of the *Journal of the R.A.M.C.* contains the following note:—During the South African War . . . Capt. L. W. Harrison, R.A.M.C., devised a very simple means of effectually disposing of this material (refuse), which seems worthy of more extended application. On field service there is always an immense quantity of empty tins of all sorts and sizes; these should be collected together and stacked in a number of little heaps about 4 feet high; upon these heaps should be piled the miscellaneous combustible rubbish, and the heap then set alight. The tins serve the purpose of keeping a good air space between the ground and the rubbish, and so cause the whole heap to burn with a fierce draught, all the combustible material being reduced to white ashes in about four hours. The burnt tins can be used again. This plan takes much less time and labour than would be required to dig trenches and bury the rubbish; moreover it does not pollute the ground. Even in wet weather the plan may be carried out, though of course not so expeditiously.

The ordinary leather *mussack* was not allowed in camp. Water was conveyed from the source already described by means of 2-inch pipes to specially constructed zinc reservoirs, impervious to rain and dust, over which a guard was placed for the protection of the supply and prevention of waste. From these reservoirs the water was carried to different parts of the camp by mules supplied with galvanised zinc *pakhals*, covered with thick felt, which, when damp, kept the water cool. Each unit brought a section of its regimental dairy from Quetta, so that all butter and milk used in camp were under constant supervision. Transport animals were located at the foot of the hill, and a separate branch water-pipe laid on for their use. Here, too, was chosen a suitable place for the slaughter-house, with special conservancy arrangements, including a small incinerator for the destruction of diseased livers, etc., a large percentage of which were affected with fluke. An excellent site was also selected for the commissariat supply depôt and bakery. Field-ovens were used, and the bread baked was invariably of excellent quality.

Special sanitary rules were drawn up and printed for the use of each company cook-house, which prevented slops and refuse from being thrown about. The neglect of this simple order is the chief attraction for the swarms of flies so frequently seen in and about cook-houses. During the season two officers contracted enteric fever; one from drinking water at a distant village while out shooting, the other owed his illness to having drunk water from an unknown source on the march from Quetta; but not a single case occurred among the men. The season was an exceptionally unhealthy one with the civil native population, as typhus fever and cholera were prevalent from May to September."

Colonel McGill writes with respect to

### PURIFICATION OF WATER.

"On active service troops often suffer severely from water-borne diseases, and various plans have been suggested to provide them with a pure drinking water. It is generally necessary to clarify the water before making an attempt to purify it, and this can easily be done by sedimenting with alum or straining through a cloth or Maignen's filter. In order to render water innocuous it has been proposed to sterilise it by means of chemicals; but the results obtained under the conditions of active service have so far not been satisfactory, and the methods have been reported as unreliable and cumbrous. Lately, Vaillard has sterilised water in ten minutes by means of tabloids containing (*a*) potassium iodide and sodium iodate, (*b*) tartaric acid, and (*c*) sodium hyposulphite.

The Pasteur-Chamberland, Mallie and Berkefeld filters can efficiently sterilise water; but they have not proved satisfactory when tried with moving bodies of troops, as portions of them are easily broken, leakage often occurs, allowing the sterile and raw water to become mixed, and the filtering medium requires to be frequently cleaned and sterilised, both of which operations are liable to cause minute lesions of the surface of the bougies, with consequent impairment of the germ-stopping power of the filter. The most suitable filter for use on field service is the

Berkefeld. No reliance can be placed on the efficiency of their sterilising powers unless frequent bacteriological examinations of the filtrate can be made.

Only by boiling can water be rendered absolutely safe, and unfortunately the process is often difficult to carry out on active service. Two forms of field sterilisers are at present highly recommended. One, the Forbes-Waterhouse water steriliser, is the pattern used by the American Army. This apparatus weighs 90 lbs. when packed, and can deliver hourly 25 gallons of sterile water, having a temperature 15° to 20° F. higher than that of the raw water, with the consumption of only 8 ozs. of kerosene oil. The apparatus should be worked under shelter, as wind easily disturbs and extinguishes the flame of the lamp. The second pattern of steriliser is Dr. Leigh Canney's, which consists of a copper cylinder, the bottom of which is involuted into eighteen pockets, so as to increase the area of its heating surface. The whole apparatus weighs 60 lbs. and can sterilise 6¼ gallons of water in from nine to thirteen minutes, according to the temperature of the water, with the consumption of about 8 ozs. of petroleum.

Standing camps* should be provided with approved water which has been sterilised by means of either of the above apparatus. Troops on manœuvres and on the march should also be supplied with sterile water. As carts can be used on such occasions, the necessary apparatus for a regiment—four sterilisers and two 200-gallon storage tanks—may easily be sent on ahead of the troops, and sufficient water sterilised in four hours. It is a far more difficult matter to provide moving bodies of troops on active service with sterilised water. There is no doubt that troops should be supplied with some portable and rapid means for sterilising water in the field, and I think the only method will be to provide each man with sterilising tabloids and instruct him to invariably use them with any water of doubtful character. In addition, every 200 men should be provided with one steriliser, in the charge of specially trained men, which could supply them in four hours, while encamped, with sufficient approved water for their water-bottles and carts or *pakhals*; though in the case of troops marching all day, camping late, and starting early next morning, the boiling of a sufficient quantity of water to meet requirements will often be found a very difficult matter.

The Forbes-Waterhouse steriliser is, I think, the best pattern for use in the field, as it has several advantages over Leigh Canney's, the lightness of which is nearly counterbalanced by the weight of the fuel required to be carried for its operation. Besides, the only type of steriliser which will be of practical use on the field is one that can supply the thirsty soldier with cool sterile water in the shortest possible time, and the Forbes-Waterhouse apparatus meets this requirement better than any other that I am acquainted with. Drinking water should always be carried and stored in camp and in the field in covered metal vessels, which must be provided with taps and frequently cleaned. Leather *pakhals* and *mussacks* must never be employed for these purposes, as

* Except when pure water is otherwise assured.

they are generally dirty and impossible to clean with any degree of certainty.

In connection with the incidence of the water-borne diseases—enteric, cholera and dysentery—among troops in camps and on field service, it should always be kept in mind that the men will be less susceptible to them if the camp area is carefully sanitated, all refuse removed and burned, excreta buried deeply and covered several times a day, trenches frequently disinfected, all cases immediately isolated, and their clothing, bedding, feeding utensils and tents disinfected.

## CAMP SANITATION.

*Cooking Places* should be placed on the flank of the camp which is opposite to the side nearest the trenches. The surface around kitchens should be cleared for a radius of at least ten yards and kept scrupulously clean. Kitchen refuse must always be kept separate from ordinary dry rubbish, and neither it nor the sullage water should ever be thrown on the ground. In temporary camps occupied for only one or two days, cook-house garbage and slops may be cast into separate small pits about 2 feet deep, which are to be dug outside the perimeter. The earth at the bottom of the pit for slops should be well loosened for a depth of a couple of inches and a little loose earth should be thrown over the slops and dry refuse several times a day. All kitchen refuse pits should invariably be completely filled in before the troops march out of camp. In standing camps all cook-house garbage and slops should be deposited in separate covered zinc or tin receptacles, emptied at least once a day and disinfected by chlorinated lime or by burning some dry litter in them. The ground on which the receptacles are placed should be well beaten down and kept clean, the sites being frequently disinfected and moved from time to time.

*Refuse* in any form should never be permitted to lie about a camp area. A considerable amount of dry rubbish and litter can be usefully disposed of by burning it in the latrine and urine trenches and over soiled areas of ground, and so utilising it as a disinfectant. A convenient and effective method for disposing of refuse in standing camps is to throw up a small bank 2 feet high round a horseshoe-shaped piece of ground, on which the litter is first allowed to partially dry and then thrown evenly along the outside of the bank and ignited. The fire burns almost continuously and no nuisance is caused. On no account should litter or refuse ever be spread out on the ground to desiccate under the influence of sun and air, as a nuisance will certainly be caused, flies will be attracted, and there is a great risk of food or water becoming contaminated. All garbage and offal should be removed daily from kitchens and slaughtering places and burned at some distance from the camp. In the stationary camps Horsfall's moveable destructors might be employed for the destruction of refuse—when fuel is easily obtainable.

*Latrines and Urinals.*—It is always better to dig a few long trenches than a number of small ones, as they can be more easily supervised, and soil pollution is more limited. All deep trenches must be filled in when the contents are

about 2 feet from the top, and the earth should be well banked up over them so as to clearly mark their sites. To ensure the trenches being kept in a sanitary condition, the men should be particularly instructed to throw some earth over their dejecta before leaving the latrine, for which purpose a few scoops might be provided. The sweepers should be made to cover all exposed excreta by throwing a little loose earth into the trench three times a day; they should allow no soiled paper to blow about. A shallow drain should be dug on the higher side of the latrine to prevent surface water entering the trench, which, if possible, should be sheltered with a light thatch roof. All latrine and urine trenches should be daily disinfected by burning in them a layer of dry litter three or four inches thick. To prevent unnecessary surface pollution of the camp area, night latrines and urinals should be provided in all camps. In standing camps they ought to be worked on the removal system, the receptacles (empty kerosene tins) being taken into use at nightfall and removed at *reveillé*, when the sites on which they were placed should be cleaned and disinfected with burning litter or chlorinated lime solution (1·5 per cent.). This system of removal works very well if carefully supervised, but is far inferior to the American Army trough method, in which milk of lime is utilised as a disinfectant.

When field operations have to be carried out in a country with an Arctic winter, all excreta and garbage from a standing camp should be disposed of by cremation. Otherwise, when a thaw sets in the nuisance caused by the exposed filth, which the frozen state of the ground prevented being covered at the beginning, would be appalling, as was demonstrated in Northern China.

*Infectious Diseases.*—Every large standing camp should be provided with a Thresh's portable emergency steam disinfector, or an Arnold's steam steriliser, for the disinfection of clothing belonging to cases of contagious diseases.

# *REVIEWS.*

## DER KRIEGSSCHAU PLATZ IN OSTASIEN.

*By* Major Joseph Schön, 1904.

This is a very serious topographical description of the theatre of war, 310 pages, with a general map on a scale of 1 : 1,500,000, a map of the Liao-tung peninsula at 1 : 100,000, a skeleton general map (showing the mountains by thick black lines) at 1 : 5,000,000, and plans of Vladivostock, Mukden and Liao-yang. It has been compiled mainly from Russian and German sources.

The book is divided into three main parts, Korea, Manchuria and the Russian Coast district; and besides the topographical features, deals with the climate, population, transport, routes, inhabited localities, resources and strategic conditions.

The road up the east coast of Korea to Vladivostock does not appear to be promising. From Gensan onwards it is continually ascending and descending the numerous ridges, which run towards the coast at right angles to the watershed and are only separated by very narrow valleys. It crosses numberless torrents with steep banks, and in some places is only about a mètre wide. It is full of large holes washed out by rain and covered with stones and boulders. In many places the gradients are too heavy for wheeled traffic. There is plenty of water, but little firewood.

The spelling of the place names is Teutonic; it is difficult at first to recognise old friends like Pingyang and Wiju as Pöngjang and Widschou.

## THE RUSSO-JAPANESE CONFLICT; ITS CAUSES AND ISSUES.

*By* Dr. K. Asakawa, Ph.D.—(Constable. 7s. 6d.).

This is a diplomatic history of the causes of the war, presented with a logical thoroughness that reminds us of the military operations of the author's countrymen now in evidence in Manchuria.

Although the book bristles with references to Bluebooks, and gives *in extenso* the various conventions, agreements and treaties which have been negotiated in the Far East during recent years, so that it is a valuable work of reference, yet the matter with which it deals and its

style render it almost a romance; and we confess that once having taken the book up we did not lay it down until it was finished.

An introductory note deals with Japan's economic interests in Manchuria and Korea; her dependence on those countries for food supplies and for markets for her manufactured goods; the advantage of her short sea route to them over Russia's long land line; and the impossibility of Russia being able to compete on even terms. This note is the only dull part of the book and may be omitted. Chapter I. is headed "The Retrocession of the Liao-tung Peninsula"; but it actually commences at the year 1860, when Russia, taking advantage of China's defeat at the hands of the allied forces of England and France, definitely annexed China's vast territory lying between the Ussuri river and the Pacific. The dramatic story of Russia's gradual advance southwards and her unscrupulous use of opportunities are traced to their culminating point in the failure of her diplomacy when she at last met a nation prepared to defend its liberties and rights with its blood.

The author treats his subject with impartiality and moderation. He thinks, no doubt rightly, that had negotiations remained in the hands of the thoughtful men at St. Petersburg instead of those of "that executive officer of great talent, but strategist and diplomat of unknown value, Admiral Alexieff," the present war might have been avoided.

The interest of the book is increased by good portraits of Count Cassini, Count Lamsdorff, Count Katsura (the Japanese Premier), M. Lessar, M. Pavloff, and other actors on the diplomatic stage of the Far East.

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## THE RUSSO-JAPANESE WAR.

*By* T. COWEN.

The author has spent fifteen years in the Far East, and was one of the War Correspondents of the *Daily Chronicle* from February to May, 1904, when, owing to the severity of the Censorship, he ceased sending his despatches, but still remained at the seat of war.

The book contains the best general account of the war up to the battle of Liao-yang which has yet appeared, and much information which has not been given elsewhere; *e.g.*, when Japan was considering whether Russia's action on the Yalu would prove a *casus belli*, the Russian Minister to Korea, M. Pavloff, who ought at that critical time to have had no thought for anything in the world except diplomatic problems, was chiefly concerning himself with the friendly relations of Madame Pavloff, his wife, and Colonel von Raben, his Military Attaché, and at the last actually fought a duel over the matter and was slightly wounded.

The author makes an interesting comparison between the Liao-tung Peninsula and the S.W. extremity of England. "The land lies in a very similar position and the nature of the coast line bears some resemblance.

If Mount's Bay had three or four miles of anchorage inside ot the island, and if St. Michael's Mount were three or four miles long and connected with the mainland at all states of the tide on one side, it would resemble Port Arthur. Land's End and the Lizard are not at all unlike Laoteshan and the headlands towards Dalny. The whole coast is just about as rocky and rugged. . . . On the north side of the peninsula the parallel is nearer . . . but the port of Newchwang is on a dead flat instead of being on rising ground like Bristol."

Mr. Cowen, after his war experience, holds that "Naval force is the most important as a first line of defence for an island nation, or a first step in attack, but as a rule is merely auxiliary in bringing about a final decision."

The book is well illustrated by photographs and drawings by a Japanese artist, but the plans of Port Arthur and Liao-yang are indifferent.

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## A SECRET AGENT IN PORT ARTHUR.

*By* WILLIAM GREENER.

The author was in the employ of *The Times*. His work is interesting, but, while giving much local colour, he tells us very little about the war. He reached Port Arthur from Peking *viâ* Mukden on the morning of 9th February, 1904, just after the first Japanese attack on the fleet.

"The torpedo attack and the subsequent bombardment had astonished the Russians; the only word which expresses adequately the condition of the authorities is 'flabbergasted,' for they were rendered defenceless by their unlimited bewilderment. A few well-armed, daring troops, landed immediately after the torpedo attack or simultaneously, would have captured the town, the staff and the heads of departments, and might have carried at least one of the forts."

Towards the end of February Mr. Greener was discovered and turned out of Port Arthur. He went to Newchwang (Yingkow), where he seems to have remained, sending reliable Chinamen out into the theatre of war to get news. He gives specimens of the bulletins he received. "I see four Russian guns at Yuen-pao Mountain; I see many troops of Russian there; I see guns at An-chu and troops. . . . There was bobbery." "Russian soldier cross Yalu river. Come back this side. He no wait. He go thereby in small sampan; no can; boat lost. Russian men all lost. . . . ."

The most valuable part of the book is the account of the Russian and Japanese troops whom the author was able to observe during their respective occupations of Newchwang. Any Russian sentry could be passed by replying K'Chortu (to the devil). "The Russian officers and the Russian troops from the British standpoint of to-day were licentious, dissipated and immoral, as well as rough to occasional brutality. . . .

When they left they took with them their women, their drink, their dirt, their noise—and the goodwill of the bulk of the foreign residents. Judged by the standard of to-day they lack seriousness, refinement and education. . . . As soldiers they most lack ardour for their profession and the courage that comes from an intelligent conception of duty."

"The Japanese appear to possess a talent for organization, which amounts almost to genius. In a few days the visitor would have believed that they had been in military occupation of the treaty port for months. . . . There was a censor appointed and he could always be found."

"In the game of life Russia disregards all the rules which Western civilization has decreed to be right. In politics, in commerce, in law, in the big things and the little things of life, Russia is a law to herself. The Japanese, on the contrary, have accepted the Western standard." Which then is the peril?

Mr. Greener has many hard things to say of the British consuls in the Far East. "Reared in a cold storage establishment, grappling all their days with Mandarin Chinese and fine print," is his description of them. Their offices are full of doors marked 'Private' and 'Judge's entrance,' and other legends forbidding your progress." On leaving one "you turn to see if the motto under the British coat-of-arms does not read 'Non possumus'; and you wonder what the Consul does besides sentencing British subjects to deportation." "To all enterprise he is a passive resister." We await the Consuls' description of Mr. Greener.

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## PORT ARTHUR: THREE MONTHS WITH THE BESIEGERS.

*By* FREDERIC VILLIERS.—(7s. 6d. Longmans).

Mr. Villiers, after waiting some months at Tokio, was permitted to join General Nogi's army as representative of the *Illustrated London News* in August, 1904. His book contains much about his lodgings, his meals, his dreams, his illnesses, his servant and his fellow correspondents; but very little about the military aspects and events of the siege. The map is an extremely poor one. There are 37 illustrations:—Mr. Villiers being presented to the Emperor of Korea, Mr. Villiers' servant, Mr. Villiers' horse, Mr. Villiers' breakfast, Mr. Villiers' sleeping bag, Mr. Villiers' invitation to dinner, General Nogi at lunch, Admiral Togo after lunch, General Tsuchiya's outspread left hand and the right half of his face, a sketch of the bamboo hand-mortar (we seem to remember that Major McMunn made one of these at a minor siege, inside, some years ago), and some half-dozen sketches of the environs of Port Arthur are alone of military interest.

N.B.—The Japanese call Port Arthur Ryo Junko.

## FROM TOKIO THROUGH MANCHURIA WITH THE JAPANESE.

*By* L. L. SEAMAN, M.D., LL.B. (Major and Surgeon, U.S.V., in the Spanish-American and Philippine Wars and with the Allied Armies in the Boxer Campaign in China).

In Parliamentary language the title of this work is misleading; by the writer's own confession he did not go through Manchuria and was never with the Japanese forces. On the 98th page of his 268-page book he leaves Japan for the more congenial atmosphere of Chefoo, where, to use his own words, "the most unconscionable band of liars that ever existed seemed to have their headquarters." He made one trip to Newchwang, was there when the Japanese occupied it, and went out as far as Hsin-min-tong under Chinese escort; this, together with hearing the bombardment of Port Arthur, seeing a mine floating in the Gulf of Petchihli, and meeting a Russian who had the base of a shrapnel in his back, is about the sum of his war experiences.

For those who wish to know how the 4th of July is kept in Japan; how when Marshal Oyama left, "amid the tumult of 'Banzais' there was heard the shrill voice of an American woman"; of the doings of the Volunteer American Nurses who were "not familiar with the Japanese language"; and of the efficiency of American Consuls, the book may be of interest. But it is of no use to the student of the military history of the campaign.

There are some remarks which hardly bear the impress of accurate observation in the account of the author's visit to Wei-hai-wei, "where the British have their military zone of occupation in the north." In this "fortress" he made the acquaintance of two officers of the British garrison, Colonel Bowers and Major Muspratt. He adds Maru (which is only used with the names of merchant ships) to the unfortunate battleship *Hatsuse*.

There are illustrations of the Chinese junk on which the American newspaper correspondent Etzel was killed; of "the harbour of Chefoo, showing the American Consulate"; of "the evacuation of Newchwang, the American Consulate in the distance"; of the author and his companion in various positions and in various company, including that of Li Hung Chang (who died in 1900).

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## WITH KUROKI IN MANCHURIA.

*By* FREDERICK PALMER.

Mr. Palmer is an American correspondent, who joined General Kuroki's army a week before the battle of the Yalu. His narrative closes with the battle of Liao-yang. Although not precisely military history, it contains, thanks to his keen and trained powers of observation, a vast

quantity of information with regard to the Japanese army in the field and the Russians as an enemy.

The author frankly admits the difficulties which beset both the military attachés and the correspondents. It was impossible to allow them much freedom of movement because "let them appear on the line of outposts and they would be taken for Russians." The average Japanese cannot tell one European from another any more than the average Englishman can distinguish a Japanese from a Chinaman or Korean, with hair cut the same way and wearing much the same kind of clothes. "So the attachés ride behind the staff and the correspondents behind the attachés."

The account of the battle of the Yalu, written at Antung five days afterwards, is picturesque, but it unfortunately lacks a map, as also do the accounts of the other engagements. "So well did the Japanese fool their enemy that they struck the Russian when he was unprepared and never sent a man against him when he was prepared." "With 40,000 victorious soldiers in their rear the Russians moved as one vegetating Siberian garrison would move from an old to a new post," with the soup-boilers and their broad heavy carts designed for the Steppes. The captured Cossack swords were dull-edged!

To the Japanese army "all is team play; nothing is for any gallery, unless it is the international gallery. . . . As no corps, no division, no regiment stands out with the conspicuousness common in other lands, so does no general. The private is a private; the officer an officer, impersonal." "A Japanese general knows that any force, however small, will stay where it is placed—stay, alive or dead. One company is as much like another as peas in a pod; no special units, no Rough Riders, no King's Own." The Japanese use individual fire; "When the Russians answered, it was always in volleys . . . they fire as they march, in a flock. . . . They aim in the general direction of the enemy, with the result that they fire into the sky." In the early morning attack on the Motien pass the Russians advanced with drums beating in the front line.

Mr. Palmer points out the inferiority of the Japanese field gun to the Russian. "It is of an old pattern, the range is 1,000 yards less than the enemy's, the shell 3 lbs. lighter, the muzzle velocity 300 feet less per second; and it can fire only one shot, where the Russian gun fires two or three."

The methods of the generals are neatly contrasted. At Tensuiten Keller stood in a battery where he could see, his staff with him, exposing "the very spinal cord of his force"; while Kuroki "sat in safety, his staff around him, in touch with all his units" by telephone and messenger. "Keller was a heroic spectator, but not a modern commander . . . he was as much out of place as the guard of a train on the cow catcher. He was simply a magnificent personality; and nowadays, personalities win decorations and machines win victories."

Mr. Palmer is of opinion that there is some danger of the Japanese thinking other Occidental armies are as stupid and slow as the Russian.

The book is illustrated by 20 good photographs, including one of General Kuroki and his staff, but (as before noticed) has no maps.

## THE ROYAL ARTILLERY GAZETTEER.

(R.A. Institution, Woolwich. 9½ × 6. 1s.).

This book of some 130 pages gives information about places abroad where Batteries, Companies and individual Royal Artillery Officers are stationed.

A frontispiece, folded so as to open clear, gives a list of 24 questions under the headings Military and Regimental, Communications, Climate, Uniform and Plain Clothes, Pay, Leave, Sport, Furniture, Horses and Vehicles, Servants, Dogs, Languages, Amusements. Education, General Remarks. The book itself contains the replies to these questions, numbered correspondingly to the frontispiece, for some 90 stations, of which the majority are in the East Indies. Appendices give respectively Customs Duties in Canada and Rates of Indian Pay and Allowances.

The information has evidently been carefully collected and checked, and a great part of it would be useful to officers of all branches of the army.

## IN THE PATHLESS WEST WITH SOLDIERS, PIONEERS, MINERS AND SAVAGES.

*By* FRANCES E. HERRING, *Author of "Among the People of British Columbia," etc.* 8vo. 240 pp. (T. Fisher Unwin, 1904).

This book is a curious medley of stirring incidents. It begins with the voyage of the good ship *Thames City* in November, 1858, from Gravesend with a strong company of Royal Engineers (120), and half as many more women and children, destined for British Columbia.

The men had volunteered to do the pioneer work of this new colony, and the *Times*, in a leading article, paid the Corps a compliment upon the occasion:—

"Whenever Her Majesty's Government want a body of skilful, intelligent, and industrious mechanics to perform any task requiring peculiar judgment, energy, and accuracy, such as the arrangement of a Great Exhibition, the execution of an accurate National Survey, and so on, or even the construction of houses, roads, and bridges, in a new colony, they have only to turn to the Corps of Royal Engineers and they find all the material that they want."

In a short preface the author expresses her obligations to Colonel Wolfenden (who was one of the Company of Royal Engineers that went to British Columbia on board the *Thames City* in 1858, and whose honourable career in British Columbia was referred to not long since in this *Journal*) for the loan of *The Soldiers' Gazette and Cape Horn Chronicle*, a weekly newspaper issued regularly during the voyage to Vancouver, extending over five months.

The various incidents of the voyage are described, the ceremony on crossing the line and the amusements on board. The ship put in to Port Stanley, in the Falkland Islands, where the redcoats quite upset the quiet and decorum of that remote and staid little place. After rounding Cape Horn the detachment came in for the usual cold and tempestuous weather so common in those parts, and encountered a big storm. While working up the coast of Chili the crew obtained drink from the steward and mutinied. The Sappers were called to arms and the mutineers were clapped into irons and landed at Valparaiso, a day's sail away, the Sappers working the ship. Here a fresh crew was shipped and the voyage continued without further incident to Esquimalt.

A detachment of Royal Engineers, under Capt. Parsons, had left England by the steamer *La Plata* two months before the *Thames City* sailed from Gravesend, and was stationed at Fort Langley, up the Fraser River. Thither the later detachment also proceeded, until Colonel R. C. Moody, R.E., the Governor, had the whole of them encamped lower down near the site of the capital, New Westminster.

A print is given of the R.E. Camp above New Westminster in 1862, and there is a pretty view of Esquimalt. The book contains many amusing stories of the new colonists, and a description of life in the city.

"Sunday was quite a gala day in the little town, for then the military, splendid in their red coats, shining boots, and bright buttons, paraded to church, headed by their band, and all the citizens came out to see them and enjoy the music. Indians by the hundred stood around, mostly wrapped in blankets and without anything on their feet. They far outnumbered the little band of whites.

"Up the hill, into the little wooden church marched the soldiers, followed by the rest of the congregation, for few entered until they had seen the sight of the day. The officiating clergyman was the Rev. John Sheepshanks, the present Bishop of Norwich, who lived in a little log cabin near by.

"It was great to watch the young married women and the marriageable girls come mincing in, tossing their heads at every measured step, screwing their mouths into a 'prunes and prism' expression, and putting on 'French and frills' generally. Yet one of these latter young creatures, from fourteen to seventeen years of age, would perhaps by another Sunday be wending her way over mountain and prairie on horseback to the home of a well-to-do husband, whose acquaintance had been made within the week, and who had journeyed down with the express purpose of taking back a white wife."

After the colony had attracted a certain number of colonists, the people began to grumble at the cost of the military, and it was decided in 1863 to bring home all the Sappers who did not want to take their discharge and settle in the colony. Those who remained received each "160 acres of land free and unencumbered, wherever they chose to select it, with an honourable discharge. . . . Most of the married men remained; many of them had wealthy sons-in-law by this time, and grandchildren born in the colony, although they were still in their prime themselves. The camp, indeed, had added bravely to its numbers.

. . . But few have regretted their stay; and if they have, it has been their own fault, not that of the country."

The second half of the book is mainly about the Indians of Fraser River and the far North, their habits and superstitions. This is well told in relation to actual braves and squaws, and to a pathetic story of a little English boy named Billy Hilyard.

Billy is first seen embarking at Gravesend with his stepfather, a surly sapper, one Billings — Billy's mother dies in child birth in the storm encountered after rounding Cape Horn, and the infant dies too. The bodies are buried at sea:—

"There was a grating slide, a splash, a wild cry from a lonely child, and—'Rest for the weary.'

"Poor little Billy crept away to the dog kennel unnoticed, and clasping his arms around the neck of one of his cannie friends he cried himself to sleep. The other one lay near him and kept him warm.

"The storm rose again, the hatches were battened as before, and only the unconscious child was left on deck.

"Whew! how the wind shrieked, the good ship groaned, and the subdued and saddened 'citizens' below clung to their berths. . . .

"Now the pair of dogs were thoroughbreds, and were coming out on consignment, so they were provided with a good watertight kennel, well lashed to the deck; but the late storms had loosened these lashings, and a sea struck the good little ship with such force that she shivered from stern to stern like a living thing. As it left it carried kennel, dogs and sleeping child with it. The progress of the ship had been stayed by the shock, and she stood almost on her beam ends, so when the wave returned it brought back the kennel, one dog, and the child, his arms still around its neck, his tear-stained face still pillowed on the shaggy coat. The kennel was jammed in in such a way that there was no danger of its moving again.

"'My God!' ejaculated the big, burly mate, who had watched the return of the kennel, and had looked, never expecting to find anything, inside. 'It's the poor little chap whose mother was buried last night, and one dog!'"

Billy was taken charge of by the wife of Sapper Middleton; and when, five years later, she and her husband returned to England, he kept house with his churlish and drunken stepfather, who led him a miserable life. At last, one night he ran off, was seized by the Indians and carried away to the far North. Whether the story of his life among the savages be fact, or partly fact and partly fiction, the author has succeeded, in her description of the boy's wanderings with the Indians, in evolving an interesting narrative of thrilling adventures in which are many cruel and revolting deeds. How Billy escapes must be left for the reader to find out. The book is pleasant reading and will while away a spare hour or two.

ROBT. H. VETCH.

# *NOTICES OF MAGAZINES.*

## Army and Navy Chronicle.

*March*, 1905.

This periodical, established in January, 1900, is now brought out on new lines as an illustrated Naval and Military Magazine, published on the 2nd or 3rd Friday of each month so as to catch the Indian and Colonial mails. Its dimensions are 11 by 8½ inches, a very convenient size, and its price 6d., post free 8d. The office is at 111, Jermyn Street, St. James', S.W.

The letterpress of the March number contains articles on Military Cross-Belt Plates, the Yeomen of the Guard, Some Famous British Naval Exploits, the Romance of Regimental Marches, Burney's School in the Seventies, and lists of the current stations of Military and Naval Units. The illustrations include:—The Royal Visit to Portsmouth, Lieut.-General Sir J. French and Staff of Aldershot Army Corps, the upper deck of H.M.S. *Talbot* (1st class cruiser), the Yeomen of the Guard, types of Cavalry Drummers, views in Portsmouth Dockyard, and reproductions of some old mezzotint engravings.

## Bulletin of the International Railway Congress.

*February*, 1905.

The two sections of the February number aggregate some 600 pages of reports to be presented at the Washington session. Hence even to skim the contents has taken some time, and it is impossible to extract the essence of all.

There are two reports on *Concrete and Imbedded Metal*, containing a mass of information both as to the practical and theoretical employment of this system of construction. There seems no doubt that for Railway purposes the use of armoured concrete is economical, particularly as the maintenance cost of bridges is very low.

Attention is drawn to the Considère system, in which cross armouring is replaced by continuous hooping, *i.e.*, a helical arrangement of the imbedded steel, affording great resistance to compressive forces. Retaining walls of *Béton Armé* are stated to be more satisfactory than masonry, particularly if the ground is of a shifting variety; the weight of the earth

itself can be utilised to bear on a horizontal ground plate to which the thin face is anchored by armoured ribs. (Such walls have been used at the Southampton Docks). An interesting point is that the cement covering has now been proved to prevent rusting. It is even possible to establish that a rusty rod when imbedded in concrete very soon has a bright surface again.

Professor Hatt, of Purdue University, has made a series of experiments and deduced a formula as under for concrete steel beams:—

$$M = Kfbh^2;$$

where M is resisting moment in inch-pounds;

P is percentage of steel in cross section in lower flange (not to exceed 3);

$b$ is breadth of beam in inches;

$h$ is depth of beam in inches;

$f$ is tensile strength of concrete in pounds per square inch;

$u$ is fractional depth of the steel from the top of the beam;

K is a constant which is as follows:—

For 1:2:4 stone-concrete beams

$$K = (\tfrac{1}{3} + (\tfrac{7}{4}u - 1)\,P)$$

or

$$M = (\tfrac{1}{3} + (\tfrac{7}{4}u - 1)\,P)\,.\,fbh^2.$$

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BOOK-KEEPING.—Here again we have two reports, one for all countries except America and Russia by the Chief Accountant of the Kaiser Ferdinands Nord-Bahn, and one for America by the Chief Accountant of the Southern Railway. The subject has been approached from quite different standpoints in the two reports, for, whereas the former discusses principles of the accounting scheme, the latter practically consists of a detailed description of a typical American system. It must suffice to note some points from the former report, which naturally refers mainly to Austrian methods, and these have already received some notice in the *Journal*.

Government Railways naturally proceed according to some sort of Budget Estimate; but it is practically indispensable that those items which vary according to the traffic should be left more or less indeterminate in making the forecast; there are cases where, owing to the way in which the Budget is drawn, a rush of traffic requires Parliamentary authority for the expenditure involved to meet it! At the same time it is necessary that there should be some central check on payments, *i.e.*, no account should be paid until it has been checked and authorised by a responsible official; but it is not necessary to centralise the cash. The writer notes with surprise that, while in England cash is banked locally, payments are made by travelling officials, whereas it would appear practicable to authorise payments against the cash paid in by Stations locally.

It is most important to frame a good system of grouping together expenditure accounts. These may be made up (*a*) by posting all the vouchers under different heads, (*b*) by making the departments each prepare classified summaries, or (*c*) by compiling an account for all

departments in a central office. In this latter case all the vouchers are posted to an expenditure suspense account, and this is afterwards made to balance with the monthly accounts.

Certain suggestions are made for the simplification of Traffic accounts at Stations—*e.g.*, the use of "Franking stamps" for parcels, thereby eliminating a vast amount of clerical labour—the checking of accounts of the Despatching and Receiving Stations together (accounts being sent from one station to the other), thus eliminating Abstracts to headquarters—the suppression of the Waybill, the consignment note only accompanying the goods, and despatched and received Registers shewing charges being kept at each end. (This is being done on the German Lines). It is considered sufficient under this method to confine the audit check of charges to occasional items.

The principal difficulty in accelerating the division of revenue is the complicated basis upon which rates are made up. Attempts have been made to group the traffic and divide the receipts according to certain co-efficients based on experience. "This method of division does not involve one-tenth of the work necessary to exact calculations. It appears, moreover, that the results differ but little from those obtained by exact accounts."

An important point is that the power to authorise expenditure and to authorise payments should be kept separate.

C. E. VICKERS.

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## CENTURY MAGAZINE.

*March*, 1905.

THE NEW SIEGE WARFARE AT PORT ARTHUR.—By Richard Barry (American correspondent).—This is a really valuable article, as it gives many important details with regard to the siege.

One morning in August General Nogi stood before his battalion commanders at Port Arthur with a pick in his hand. Its nose and heel had been worn away until the shank of rusted iron resembled an earth-dappled cucumber. Fondling it, the general said:—"Take a lesson from this Russian pick. Your men must dig. They are too eager to ask 'Why intrench to-night when we are going forward in the morning?'"

Nogi here went to the heart of the problem. It had cost him 25,000 men to learn that the Military Engineer must precede siege assaults, as his brother, the Civil Engineer, precedes rapid transit in New York.

Mr. Barry deals with the artistic Japanese methods of "invisibility"; how they made Kaoliang screens and carried away to the rear all the earth excavated from saps and parallels, making no parapet whatever. "As fast as the earth was displaced, they carried it with gabions and bamboo stretchers through the zigzag lines behind the mountain range which concealed their guns."

The story of the bringing of the twenty-six 11-inch howitzers up to the

front is well told. "Under each gun was laid eight feet of concrete," in really permanent emplacements.

"For the first time in history armies battled under search lights," and a strategy in the use of the lights was evolved.

The bamboo gun for grenades, the dynamite wheel, the sap-head shield, the bamboo grenade lift, scaling ladders, bombproofs, telephone service, and many other matters are touched upon.

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KRIEGSTECHNISCHE ZEITSCHRIFT.

*Year VII.—No. 7.*

SPARK TELEGRAPHY AND ITS IMPORTANCE FOR THE ARMY AND NAVY.—This comprehensive article on wireless telegraphy deals with the subject from a very elementary standpoint, and would be specially useful from an instructional point of view. It can be followed by anyone having the merest smattering of electrical knowledge.

Without going into complicated details about instruments the writer gives a simple description of the "tuning" system; he gives the various *rôles* which wireless telegraphy may be expected to play on land and sea, and states that, owing to the distribution of the "waves" in all directions, it can never be expected to entirely supersede ordinary telegraphy.

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WAR TECHNIQUE AND TROOP LEADING.—Specially interesting in comparison with what is happening in our army at the present time.

The writer states that a proper organisation and training of the technical troops is of the utmost importance to ensure their proper use by a leader in war time. He lays down the following principles:—

(*a*). The most important considerations are:—

i. The peace and war organisation of the troops should be the same.

ii. Rearrangements of the peace organisation for immediate use in the field must be prohibited.

iii. The latest Reservists should be recalled when first making up the troops to war strength.

The demands on technical education are so great that it is quite impossible to train the men in all branches of their duties; one must be content if each unit—company, section or detachment—is capable of performing any technical duty. The result is that specialists are trained for specially difficult problems. The technical troops can therefore only be efficient when they take into the field the greatest possible number of their peace establishment.

(*b*). The diversity and difficulty of their duties and their trades in civil life have a much greater influence on the efficiency of the technical troops than is the case in other arms of the service. The permanency of the corps of officers, liberal provision of and a higher status for N.C.O.s, and

a common-sense distribution of recruits, are demands which are continually recurring, urgent and justifiable.

(*c*). The increase and growth of the technical organisation must take place at the same time as that of the remainder of the army.

The writer points out that the scope and diversity of technical problems has increased from campaign to campaign, and that an increase of technical demands is to be reckoned with in the future. In peace time this is not noticeable. No matter how much in accordance with service conditions the manœuvres and exercises of large bodies of mixed arms are conceived, the corresponding employment of technical troops is most difficult and is usually very much on peace lines. But the demands on technical troops in war time are ever so much greater. This was shewn in the last South African campaign and in China. The British War Commission laid particular stress on the fact that in the later periods of the campaign the strength of technical troops was absolutely inadequate.

(*d*). The peace training of technical troops is indicated by their employment in war time. The latter must be technical. It should, however, be remembered that a purely military training and education should form the basis of all technical training in peace time; this applies to the whole of the technical troops, but more especially to the pioneers.

It is of course self-evident that purely infantry training must not be carried on at the expense of technical efficiency. Under normal conditions even superficially trained technical troops will appear efficient; but this is no guarantee that they will be the same under circumstances of difficulty and danger. In the technical service there are a large number of "tricks of the trade" which have to be drilled into the men, just like fire discipline in the Artillery and handling of rifles in the Infantry.

In a second article the writer deals with the development of the various technical questions in peace time. He points out the great responsibility of the War Office in keeping pace with the times by introducing new inventions and organising, in some cases, new branches of technical troops. He then describes how these matters are disposed of.

Engineer questions are dealt with by an Engineer Committee, subdivided into three divisions for Pioneer, Fortress and Electrical details. There are also various Experimental Detachments for Railways, Telegraphs, Balloons and Mechanical Traction. This Committee is subordinate to the Inspector-General of Engineers. The Ordnance Department assists with practical experiments.

The writer draws attention to the valuable assistance rendered by private firms, whose co-operation is ensured by the employment of officers not on the active list in their various departments. He deplores the absence of a permanent *personnel* of officers for special branches, the many changes due to retirements and transfers, and the friction which prevents harmonious working.

*Year VII.—No.* 8.

The following articles are of interest:—

I. A description of the BALLOON invented by General Meusnier of the French Army.

II. An article on MORE PIONEERS, which is a criticism on a previous article entitled Our Pioneers. The writer advocates:—

1. An increase of technical troops.

2. The formation of the Pioneers into one regiment (of two battalions of four companies each) per Army Corps. Each battalion to be organised into one company of pontoniers and three of pioneers. This, he contends, is the best organisation for peace time. The pontonier companies are to be trained in bridging only, and the other companies in all technical duties. In war time one company of pontoniers and one company of pioneers is to be allotted to each Division of an Army Corps, the remaining four companies being used as a reserve for those taking the field and for siege operations.

3. The establishment of a general inspection branch of pioneers. He makes a point of the Inspector-General being as independent as possible and solely responsible for his particular branch.

III. An interesting description is given of EXPERIMENTS IN TELEPHONING by transmitting with a microphone in circuit with the carbons of a search-light and receiving with a reflector, selenium cell and telephone receiver. The writer claims to have successfully telephoned over a distance of 7 miles.

G. B. ROBERTS.

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KRIEGSTECHNISCHE ZEITSCHRIFT.

*Year VII.—No. 9.*

THE ADVANTAGES OF THE MACHINE GUN IN THE FIGHT OF ALL ARMS.—It is difficult to answer the question what value the machine gun will have in future tactics.

The circumstances under which this weapon has appeared in war have varied with the theatre and the opponents. There is no doubt about its value for small wars, but this is no criterion for the part it may play in wars for which the armies of the Continent are training.

For the War of Masses we infer, from the fact of the Russians having immediately replaced the guns they lost at the Yalu, that the Japanese are not far wrong in valuing machine guns for the purposes of the campaign now being fought out.

Taking the arms as they are at present and the existing regulations for their use, we recognize two ranges, viz., 600 m., where aimed fire with the rifle becomes effective, and 1,400 m., where the Artillery range begins. Between these two lies a zone which is open equally to Infantry and Artillery fire, but which we regard as exceptional. Could not we hand this zone over to the machine gun?

We admit that musketry can be very effective over 600 m. We have only to turn to the Russo-Turkish War of 1877–78 and the recent campaign for instances. Artillery also can give a good account of itself at ranges under 1,400 m. But both infantry and artillery would gladly surrender the intervening zone above mentioned to the machine gun.

Cavalry also has something to say in the matter, and so the question presents itself under three complexions, viewed from the standpoint of each arm.

Beginning with Infantry. To produce the requisite effect, fire at ranges above 600 m. should be collective and demands the combined effort of a large number of shooters; and to hold them in control the use of volleys by word of command in close order is requisite. The teaching of the Boer War rejects this proposal; for the English found themselves constrained to abandon their beloved volley firing. Independent fire at long ranges is difficult to carry out when it involves the use of several sights. No doubt peace experiments give admirable results, but in the field these are apt to be disappointing. Nevertheless Infantry must have recourse to long-range fire when the Artillery on its side has not sufficient superiority over its opponent to spare guns to support the Infantry.

Artillery support is always an unknown quantity. One ought to be grateful to have it at the decisive point in the objective. But everywhere else along the firing line the Infantry will have to resort to long-range fire to supplement the deficiencies of the Artillery, and there the disadvantages of this sort of fire become manifest. These are premature squandering of ammunition and careless, badly-aimed fire. An old war experience, revived by the Boer War, says it is only by abstention from long-range fire that the shooter can be brought to aim at short ranges with that steadiness and determination, not to be shaken by the sense of danger, that makes him will to hit with every round.

A prudent Infantry leader will use long-range fire as seldom as possible, because the soldier, by careless aiming at long ranges, very soon loses the habit of accuracy which has been drilled into him with so much care. All the same, Infantry must occasionally profit by the long range of their weapons; otherwise many a fleeting chance of success would be thrown away; for instance, Artillery limbered up moving into position.

In 1870 Prussian batteries stood out for hours together under infantry fire. In the future their staying power, even without shields, will be greater. The gunners kneel down and throw themselves flat on the ground in the intervals of fire; fewer numbers are required to work the guns, so that there will always be spare men to dig shelters for themselves.

When Artillery send forward their scouts and staff officers to select positions, are these people to remain unmolested and so be given a free hand to develop a formidable line of batteries at their leisure? Supposing the range to be somewhere about 2,000 m., or under. Well, there are few Infantry officers who would turn on whole companies to fire long-range volleys at a few mounted men. For such purposes the machine gun would prove handy.

Somebody has suggested that ere long Infantry will restrict itself to fire at medium and close ranges, the rest being done by machine guns attached to companies. (Experts say that by improvements in powder and reduction of calibre to 5 m.m. the fixed sight range can be increased to 1,000 m.). Magazine fire at long range is out of the question by the condition that the shooter must only deliver aimed fire.

For effective long-range fire a large number of shooters is requisite to fulfil the conditions of depth, breadth and density of swarm of bullets. Also this stream must be capable of concentration at a given point at a given time. Now, as a fact, not enough men are ever available under one command to carry this out, and so the task is attempted by too few men, who are obliged to fire as quickly as they can. This degenerates into a sort of long-range magazine fire—demoralizing for the shooter. If, therefore, the Infantry can have a long-range shooting machine firing the rifle cartridge, let it be used for this purpose; and let the shooter be spared for really effective short-range fire—which is the decisive element in battles. Another argument in favour of the machine gun is its value to sweep roads, bridges, etc., much better than riflemen.

The abandonment of long-range fire would simplify the musketry instruction of the soldier, but this can only be done when every company at least has one machine gun of its own.

For Cavalry the value of the machine gun is generally recognized, while its use for Infantry is hotly debated on all sides.

In 1870 the Cavalry was not sufficiently trained for the dismounted fight; some, even, had no carbines. Since the campaign criticism has demanded independence from Infantry support for the Cavalry. Recent improvements in small arms would have put the Cavalry in a worse plight than before had they not adopted the precedent of America and followed the precepts of General von Schmidt, who, in his well-known treatise, lays down the dismounted combat as essential. This has not been accepted with enthusiasm by the Cavalry, who see in these endeavours a danger of their degenerating into mounted infantry. This in spite of the Boer War. The Cavalries of the Continent seek to foster their knightly character, which has endowed them with a glorious tradition.

This school of thinkers should greet the machine gun with acclamation. These can bear the burden of the Cavalry fire-fight; and so relieve them from the worry and confusion of telling off horse-holders in order to develop a fire power ridiculously disproportionate to the number of men engaged. (In Denmark the Cavalry have a galloping mitrailleuse which is a sort of heavy automatic repeating rifle).

Switzerland is the first to adopt mounted machine-gun detachments. Here, where mountain warfare preponderates, the machine gun takes the place of the mountain gun when a weapon of low trajectory appears requisite.

The scope of the machine gun in the Swiss Army, where it must be adapted to the nature of the country, differs from that assigned to it by the armies of the Great Powers; the latter propose for it another *rôle* besides that of entering into the decision of the fight generally and supplementing dismounted fire of Cavalry, and this *rôle* is supporting the fighting capacity of the Cavalry in the mounted combat itself.

The mounted man has suffered in his influence both by improvement of the small arm and of the field gun. It is a question whether the Cavalry cannot reinstate the important *rôle* it seeks by using machine guns to prepare its way to attack.

Infantry can defend itself, even when in small bodies, against lance and

sabre. But if Cavalry brings up machine guns it has a strong ally against Infantry. It is not safe for Cavalry to count on the preparation of its attack by Horse Artillery. Even in manœuvres it is only by introducing unrealistic delays that the H.A. preparation can be simulated. Quick-firing guns will not alter this.

For Cavalry purposes the machine gun is best mounted on a two-wheeled carriage, with shield in position. Harnessed to this is a pair of horses, which are not taken away when the piece is fired. Plenty of ammunition should be at hand. This can be carried in light carts capable of going across country. The Swiss use pack horses.

The machine guns could often be used to support the Horse Artillery in position, and so save detaching escorts.

So long as the Artillery saw in the machine gun an inconvenient supplementary gun of a special nature, which complicated its own proper business, it extended little sympathy to its introduction. When again the authorities started special detachments it began to see a rival which would absorb a vast deal of the money otherwise to be devoted to renewing and perfecting the Field Artillery *matériel*, without which it could not hope, in the face of recent developments in small arms, to retain the pre-eminent position it had won for itself in 1870. Field Artillery must for ever strive to compete with its task of shooting at long ranges, destruction of material obstacles, firing on an objective under cover.

To admit of short-range Artillery fire being dropped the grouping of the various descriptions of pieces must be altered.

Flat trajectory guns will predominate. A few large calibre guns will be told off for special work. But with the introduction of machine guns in quantities the zone between 800 m. and 1,600 m. can be taken over by them.

Up till now Infantry has been able to render a good account of hostile Artillery up to 1,400 m., and to defend itself against Infantry attack. Its powers will be much increased by the use of machine guns.

The Field Artillery will be relieved of the responsibility for the zone under 1,400 m. It will therefore no longer be restricted to shrapnel, but may allow itself some high explosive common shell with double action fuze for use against the shields of hostile Artillery. Or, perhaps, even a general service projectile like the Maxim-Nordenfelt may prove worthy of adoption. Moreover, with this protection Artillery can be independent of Infantry escort.

When both sides are acting on the offensive it often happens that Artillery must come prematurely into action before its Infantry has pushed on sufficiently far. The protection of the guns then falls to the Cavalry, whose dismounted fire is both feeble and unpopular. So here the machine gun comes in again to keep the hostile sharpshooters in subjection, and so saves the Artillery from giving the show away by disclosing the whole extent of its position.

The whole question requires to be thought out fairly. While in its experimental stage a machine gun has been evolved, to be suitable for the double purpose of being attached either to Infantry or Cavalry. This, like all compromises, is unsatisfactory.

For Infantry horse traction under fire is unnecessary. Better carry the gun in a good spring wagon, and when the fighting begins take it out and man-handle it.

For Cavalry, if you confine yourself to supplementing the dismounted fight only, pack transport seems the best (Switzerland, Denmark), and then you can use it in hilly country. But if it be decided to use it to prepare the Cavalry attack, then the English method of the galloping carriage is undoubtedly the best.

*Various Uses of Machine Guns.*

In Colonial wars we have plenty of examples of their extraordinary value.

Flying columns, cyclists, automobile detachments.

Defence of posts on lines of communication.

Defence of railways.

Suppression of insurgents or control of towns in a hostile country; small bodies of troops would then suffice if provided with these weapons.

In mountain warfare, says General Rohne, the machine gun cannot replace the Q.F. mountain gun, but it can very well supplement it, especially in holding ravines, etc. Mountain guns, the Japanese ones for instance, are of the nature of howitzers capable of fairly low trajectory. Machine guns can supply the low trajectory fire and make up for the deficiencies of the mountain gun, especially against a moving objective.

To accompany convoys. The machine guns can be distributed over the wagons and so save men.

Strangely enough, in the Boer War the English do not appear to have armed their railway blockhouses with machine guns. The machine guns on locomotives or trollies proved themselves of value.

In fortress warfare machine guns will be used on both sides with effect. The attacker will use them at long range against working parties, and at any rate hinder civilians from being employed on fortifications.

The investment can be effected with smaller numbers, and reserves to meet a sortie can be concentrated in greater numbers, because the approaches will be held by machine guns. Indirect fire, high-angle fire and night firing with the aid of search lights can be carried out. Even wire entanglements can be mown down by machine-gun fire, which can cut the stakes.

THE QUESTION OF DISTRIBUTION AND USE OF THE MACHINE GUN.—By Lieut.-Colonel von Layritz.—This officer produces a few examples from the war in progress to support his arguments. There is no need to go into them in detail, for he arrives at the same conclusions as given in the *précis* of the previous article on this subject. He explains that the English system of distribution may be well adapted to a recruited army, but is unsuited to a conscript army like that of Russia, with so short a service. He considers the German mounting with sledge carriage superior to the English. Machine guns, he thinks, should always be kept in pairs at least, so that one may cover the other in case of a "stick." Those interested in the subject would do well to read both articles *in extenso*.

J. A. FERRIER.

## NEUE MILITÄRISCHE BLÄTTER.

*January—February*, 1905.

(1). Some new features distinguish the issues of the *Militärische Blätter* of this year; a summary of the military events of the week is given, which those who have not much time for reading will find convenient. In the numbers of this year, so far, the war in the East occupies the principal part, but events nearer home are not forgotten. Students preparing for examinations, and those interested in their profession and desirous of improving their military judgment, will welcome the tactical problems—with solutions in separate numbers—that are proposed from time to time. These problems and solutions are contributed by well-known tactical authorities, and students are recommended to carefully compare their own written solutions with those furnished by the *Militärische Blätter*.

(2). LESSONS FROM THE WAR IN EAST ASIA.—General Von der Goltz, the well-known military author, writing in the *Deutschen Revue*, considers that the spell so long hanging over Asiatics is for ever broken, that in the future Japan will have many imitators, and that easily won victories over a badly armed and poorly organized Eastern Army, with all their demoralizing effects, is a thing of the past. He welcomes the change as likely to keep Europe better up to the mark. He considers that Japanese strategy was sound in diverting large forces for the capture of Port Arthur, and sees in this success a guarantee for the final triumph of the Japanese. He deplores the antiquated form that the war has taken—a war of positions—ascribes it to the influence of the Military Engineer, and finds in it an additional reason for the long talked of reorganization of the German Engineer. He attributes the severe losses of the Japanese at Port Arthur to be greatly due to overrating the effects of their artillery fire and therefore making premature assaults. Another article on the same subject ascribes Japanese success (1) to the permanence of their organization, there being no improvisation during the war, while the Russian Corps d'Armée are in many cases drawn from sources that were not in touch before it began; (2) to their numerical superiority at the decisive points; (3) to their better tactical training. (The author, writing before Mukden, thinks that the strategy of both armies has been bad; that of the Russians because they did not make their arrangements early, so as to be able to take the offensive with superior numbers, and the Japanese because, in spite of their victories, none of them were decisive); (4) to the baneful influence of the Council at St. Petersburg, the want of harmony between the higher leaders, etc., etc.

(3). THE SWISS ARTILLERY.—As is well known, after long and exhaustive trials the Swiss authorities adopted in preference to many others the Krupp model for a quick-firing field gun. A Government decree lately issued lays down that each battery is to consist of 4 guns and 10 munition, 1 forage, 1 pack and 2 provision wagons; 4 to 5 officers, 1 veterinary surgeon, 139 N.C.O.s and men, 21 riding and 106 draught horses. The 10 wagons carry a supply of 1,120 shell, or 280 for each gun, while the

ammunition columns carry a further supply of 2,080 shells for each battery; thus each gun in action will have a supply of 800 shells. The 1st and 2nd Army Corps are to be provided with their guns this year, the 3rd and 4th next year. To each Army Corps 3 regiments of artillery are attached, 1 to each division, and 1 as corps artillery. Each regiment of artillery has 12 batteries or 48 guns.

(4). THE NEW FRENCH INFANTRY REGULATIONS are remarkable for their conciseness, being contained in a small volume of 106 pages; all mere parade movements are abolished and only such as are applicable in the field are retained; the latter are naturally of the simplest nature and are to be rigidly adhered to, the movements of the Company, Battalion, Regiment, etc., being made as similar as circumstances will allow. The importance of Study, Initiative and Resolution in all grades is strongly insisted on, and officers are reminded that their professional knowledge is not to be limited by what is contained in Drill Books and Regulations, but that they are expected to have a sound knowledge of Military History. Great stress is laid on the importance of individual training, this including moral, intellectual and physical as well as technical.

The Section is the ordinary unit of the firing line, but smaller units may be used according to circumstances of ground, opposition of enemy, etc. Based on the increased efficiency of musketry and artillery fire, attention is drawn to (1) the difficulty of obtaining reliable information, which can only be done by the troops under circumstances involving increased loss of life and time, for which they must be prepared; (2) that in consequence of the losses to which attacking troops are exposed, only such forms of attack are to be used as can be thoroughly adapted to the ground, in order to derive the greatest amount of protection from it, while at the same time retaining the necessary amount of mobility and striking power; under these circumstances the use of continuous lines of skirmishers is condemned, and in its place groups of the strength of sections or half sections and even in cases individual men will push forward independently for some previously designated feature of the ground, under cover of which, joined by the supports, all will assemble and dash forward for the final phase of the assault; (3) that in consequence of the great expenditure of ammunition under existing regulations, and the difficulty, if not impossibility, of replacing it, short, sudden outbursts of fire, designated *rafales*, are strongly recommended, thus assimilating infantry fire tactics to those adopted by the artillery. Troops for the attack are divided into three lines—(1) The firing line, composed of sections, half-sections, groups or individuals, according to ground, enemy's fire, etc., acting independently, but all pushing on for the designated goal, under cover of which the final preparations for the assault are made, followed up by the necessary supports; (2) the manœuvring troops; and (3) the reserve troops. The superiority of the attack over the defence is insisted on over and over again, as also the peculiar excellence of French troops in this form of the combat, although it is recognised that the defensive may have to be resorted to; this being the case, an offensive defence should as far as possible be adopted, and for this purpose

continuous lines are to be avoided and the defending troops grouped in supporting points, the intervals being observed and troops held in readiness to act offensively through them at the right moment. The occupation of detached positions is also recommended, in spite of the many disadvantages which German authors more particularly point out.

R. A. LIVESAY.

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RAILROAD GAZETTE.

*February* 24, 1905.

BLOCK SIGNALLING ON LINES OF LIGHT TRAFFIC (CHESAPEAKE AND OHIO RAILWAY).—When there is no money to build a second track or to provide a proper system of signalling (and the author evidently thinks auto-signalling the ideal), it is obvious that all that can be done is to devise the best method practicable for attaining safety with the appliances available. The section discussed is that from Richmond to Gordonsville—names that will be familiar to students of *Stonewall Jackson*.

The principles adopted are :—

(1). The absolute blocking of all trains against others running in the same direction, except in emergencies (*i.e.*, a space interval).

(2). The blocking of all trains against others running in the opposing direction, subject to (*a*) a station limit rule, (*b*) special cases, when special Orders are given by the Despatcher—a separate Order in each case.

The meaning of these exceptions is :—(*a*) Stations are provided with a two-armed signal only, and, when a train is to cross another at the Station, the first is allowed to draw about half-way past the signal, while, by Standing Order, trains approaching from the opposing direction must enter the loop. (*b*) In the case of trains meeting at intermediate sidings, the meeting point is definitely fixed by the Despatcher by Order, and the train men are not given any latitude to alter the meeting place in pursuance of their Rights.

The system is, in fact, an improvement on the ordinary one of Time-table running, where all security is provided by time interval, and safety depends in a great measure on protection by flagging or detonators in case of delays. A sample Timetable is printed, in which we observe that, at scheduled meeting points, the trains to be passed or crossed are indicated by their numbers in small type. As remarked elsewhere, this practice does not seem to be common.

C. E. VICKERS.

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REVUE D'HISTOIRE.

*March*, 1905.

THE CAMPAIGNS OF MARSHAL SAXE.—The description of the battle of Fontenoy is continued, but not finished. In dealing with the incident of Lord Charles Hay, the writer follows the accepted French version :—"A vous, messieurs les Français, à tirer." Hay's own account, as quoted

by Carlyle in his life of Frederick, is as follows:—"When we came within twenty or thirty paces of them (the French Guards), I advanced before our regiment, drank to them, and told them that we were the English Guards, and hoped that they would stand till we came quite up to them, and not swim the Scheldt as they did the Mayn at Dettingen."

THE CAMPAIGN OF 1794.—*The Army of the North.*—The plans of operations drawn up by the French and by the Allies are followed in great detail through their several stages, and are afterwards discussed with reference to the criticisms made upon them by Jomini, the Archduke Charles, Napoleon, and others. "The French plan is essentially the conception of military engineers; Carnot, D'Arçon, Lafitte-Clavé, de Rivière are mainly engineers who have drawn their ideas from the memoirs of the Eighteenth Century on the advantages of frontier fortresses and the combinations to which they lend themselves." At the same time the writer shows how much the Allies were handicapped by the demolition of the Belgian barrier-fortresses by Joseph II. a few years before.

In the second volume of Lord Grenville's papers (Fortescue MSS.), published in 1896, there was a series of remarkable bulletins, which purported to come from Ramon, the Secretary of the Committee of Public Safety, revealing the proceedings of that Committee. M. Aulard, a very high authority, pronounced them to be unworthy of attention; but the writer of this history accepts them as good evidence, and quotes freely from them.

SIDI-BRAHIM.—This chapter discusses the responsibility of the various persons concerned in this disaster.

E. M. LLOYD.

## *RECENT PUBLICATIONS.*

*Supplement to Field Service Regulations. Engineers:—Railway Company of Sappers and Miners and Field Telegraph Section.* Provisional. (Official. 8vo. pamphlet. Calcutta).

*Memoranda relating to the Organization, Equipment, Instruction, etc., of Engineer and Signal Corps Troops.* (Official. 8vo. pamphlet. Washington).

*Manual for Operation and Care of Colt Acetylene Flash Lantern.* (Official. 12mo. pamphlet. New York).

*Militär-Schulen*, 1905. (Official. 4to. Berne).

*Deutschlands Nächster Krieg*, by Oberstleut. Osten-Sacken-Rhein. (4to. Berlin).

*Unsere Pioniere: Eine historische und organisatorische Studie für Offiziere aller Waffen*, by Oberst C. Schweninger. (8vo. pamphlet. Berlin).

*Exerzier-Reglement für den Train vom 8 Dezember*, 1904. *Entwurf.* (Official. 12mo. Berlin).

*Instruction provisoire sur le service de l'artillerie dans la guerre de siège.* (Official. 8vo. pamphlet. Paris).

*Military Government and Martial Law*, by W. E. Birkhimer, LL.B., Major, General Staff, U.S. Army. (3 dols. Kegan Paul, Trench, Trubner & Co.).

*Military Studies* (No. 8 of the International Military Series), by F. L. Huidekoper. (Hudson-Kimberley Publishing Co., Kansas, Mo.).

*Problems in Manœuvre Tactics* (with Solutions for Officers of all Arms), by Major J. H. V. Crowe, *p.s.c.*, R.A., after the German of Major Hoppenstedt. ($8\frac{1}{2} \times 5$. 6s. Smith, Elder).

*Principles of Strategy*, by Capt. E. Nash, late R.A. (3s. 6d. Kegan Paul).

*The Evolution of Modern Strategy from the 18th Century to the Present Time*, by Lieut.-Colonel F. N. Maude, *p.s.c.*, late R.E. ($9 \times 6$. 5s. W. Clowes & Sons).

*The Fight with France for North America*, by A. G. Bradley. ($8\frac{1}{2} \times 5\frac{3}{4}$. 3s. 6d. Constable).

*The War of the Succession in Spain during the Reign of Queen Anne*, 1702—1711, by the Hon. A. Parnell. New edition. (7s. 6d. Bell).

*One Hundred Years Ago. Battles by Land and Sea: Ulm, Trafalgar, Austerlitz*, by Colonel G. A. Furse, C.B. ($9 \times 6$. 10s. W. Clowes & Sons).

*The Conquest of the South West; the Story of a Great Spoilation*, by C. T. Brady, LL.D. (8vo. New York).

*The Truth about Tibet*, by A. Maccallum Scott. (Simpkin, Marshall & Co.).

*Die Festung in den Kriegen Napoleons und der Neuzeit.* (Band 4. Studien der Kriegsgeschichte und Taktih) herausgegeben vom Grossen Generalstabe, with separate volume of plans. (10×6½. Mittler & Sohn, Berlin).

*Krieg gegen die Französische Revolution*, 1792—1797. Band 1 & 2. (Kriegsgeschichtliche Abteilung, Kriegsarchiv). (Official. Vienna).

*Im Hauptquartier der Russischen Armee in Polen*, 1863—1865; *persönliche Erinnerungen*, by J. v. Verdy du Vernois. (8vo. Berlin).

*Zur Kriegzeit auf der sibirischen Bahn und durch Russland*, by Haupt. Karl Tanera. (8vo. Berlin).

*La guerre Russo-Japonaise; résumé historique et chronologique des evénements.* Tome I. Du début des hostilités, 8 Fév., 1904, au 4 Juillet, 1904, par L. Thiriaux. (8vo. Namur).

*La guerre de* 1870–71. *Les Opérations autour de Metz: 3. Journées des* 17 *et* 18 *Août.* 3 vols. (Official. 8vo. Paris).

*Essai sur la défense des Colonies*, par Capt. Ferradini. (8vo. pamphlet. Paris).

*Military and Naval Dictionary*, compiled by Major J. P. Wisser, U.S. Army, and H. C. Gauss, Esq., of the Navy Department. (½ dol. L. R. Hamersly Co., New York).

*A French-English Military Vocabulary*, compiled by Capt. H. T. Russell, R.F.A. (7¼×4¾. 1s. 6d. Clowes).

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*Astronomers of the Day and their Work*, by Hector Macpherson. (8½×5½. 7s. 6d. Gall & Inglis).

*Extracts from Narrative Reports of the Survey of India*, 1902–03. (Official. Folio. Calcutta).

*A Handbook for Superintendents of Construction, Architects, Builders, and Building Inspectors*, by H. G. Richey. (17s. Chapman & Hall).

*Steam Turbines* (with an Appendix on Gas Turbines and the Future of Heat Engines), by Dr. A. Stodola, Professor at the Zurich Polytecknikum, translated by Dr. L. C. Lowenstein, Lehigh University. (9¼×6. 21s. Constable).

*Self-propelled Vehicles.* A Practical Treatise on the Theory, Construction, Operation, Care and Management of all forms of Automobiles, by J. E. Homans. 2nd edition. (8vo. New York).

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*Imperialism: Its Prices and Vocation*, by Emil Reich. (7½×5. 3s. 6d. Hutchinson).

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*Studies in General Physiology*, by Jacques Loeb, Professor at California University. 2 vols. (9×6. 31s. 6d. Unwin).

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*The Early History of India from* 600 *B.C. to the Muhamadan Conquest, including the Invasion of Alexander the Great*, by Vincent A. Smith, M.R.A.S. (14s. Clarendon Press, Oxford).

*The Story of an Indian Upland*, by F. B. Bradley-Birt. (9 × 5¾. 12s. 6d. Smith, Elder).

*The Sun and the Serpent*, by Brig.-Surg. C. F. Oldham. (10s. 6d. Constable).

*Jats, Gujars and Ahirs* (Handbooks of the Indian Army), by Major A. H. Bingley. (Official. 8vo. Calcutta).

*Mappillas or Moplahs* (Handbooks of the Indian Army), by Major P. Holland-Pryor. (Official. 8vo. Calcutta).

*Imperial Japan: The Country and Its People*, by G. W. Knox. (8¾ × 5½. 7s. 6d. Newnes).

*Japan: An Attempt at Interpretation*, by L. Hearn. (8vo. New York).

*A Register of National Biography*, with a Selection of the Chief Bibliographical Books and Articles published in other Countries, by W. P. Courtney. 2 vols. (8½ × 5½. 31s. 6d. Constable).

*Author and Printer*. A Guide for Authors, Editors, Printers, Correctors of the Press, Compositors and Typists, by F. H. Collins. (7½ × 5. 5s. Frowde).

*Manual of Practical Indexing*, by A. L. Clarke. (8vo. London).

*English-Japanese Dictionary of the Spoken Language*, by Sir E. M. Satow, G.C.M.G., and Ishibashi Masakata. 3rd edition, revised by E. M. Hobart-Hampden and H. G. Parlett. (8vo. Yokohama).

*German Technical Words and Phrases*. An English-German and German-English Dictionary of Technical and Business Terms, by C. A. Thimm and W. v. Knoblauch. (12mo. London).

*An Angler's Hours*, by H. T. Sheringham (Angling Editor of *The Field*). (8 × 5. 6s. Macmillan).

*The Effects of Tropical Light on White Men*, by Major C. E. Woodruffe, Surgeon, U.S. Army. (Rebman).

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H. MULLALY. Sandhurst. Infantry. 7188. 2nd Trial. Increase of 1939 in two terms.
E. R. SCHREIBER. Sandhurst. West India Regt. (refused). 6397. First Trial from the Army School. Increase of over 1700 (after one term's preparation, formerly of Radley College).
R. W. MANDERSON. Sandhurst. Indian Cadet. 5694 marks. 2nd Trial. Increase of 2049 in two terms.
J. WATSON. Woolwich. 10089 marks. 2nd Trial. Increase of 1793 in two terms. FIRST in Freehand Drawing. SEVENTH in Physics.
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E. B. TOD, Royal Navy, "Britannia." THIRD in Latin.
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G. T. SAVAGE. Passed out of Sandhurst. Gazetted to A.S.C.
G. C. SLACKE. Passed out of Sandhurst. Corporal, Rugby XV. Indian Army.
H. MULLALY. Passed out of Sandhurst. First Prize in Gymnastics. Indian Army.
J. WATSON. Passed out of Woolwich. Obtaining Royal Engineers. Corporal.
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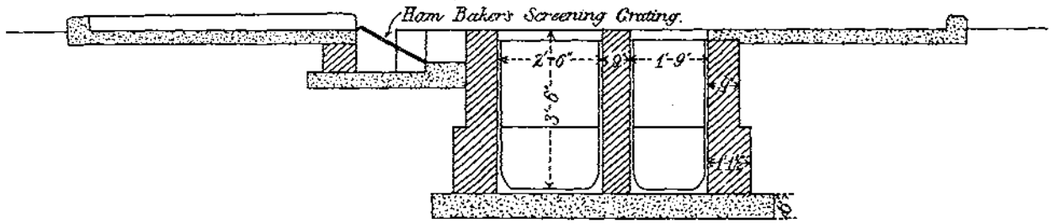


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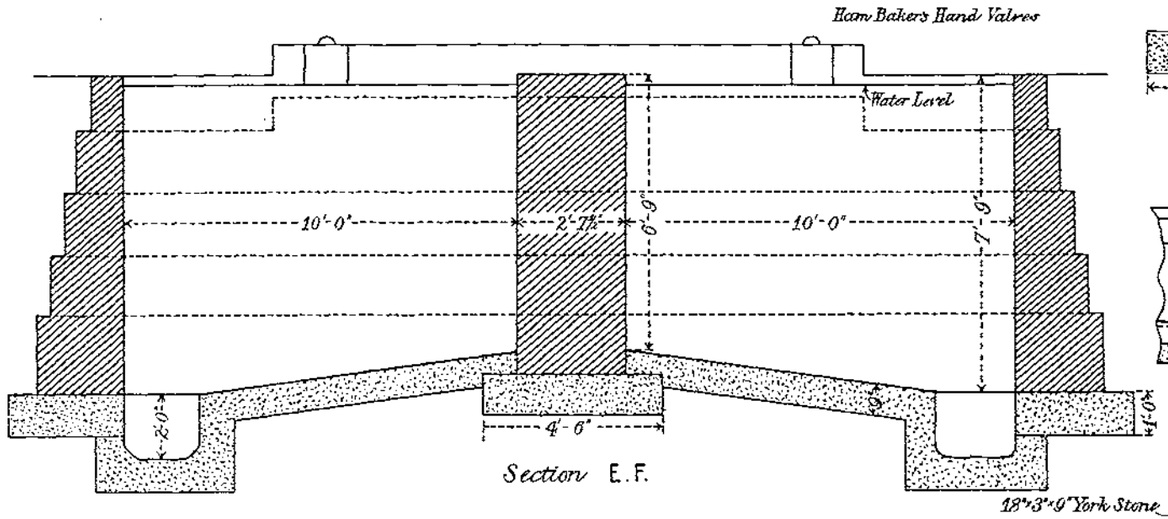


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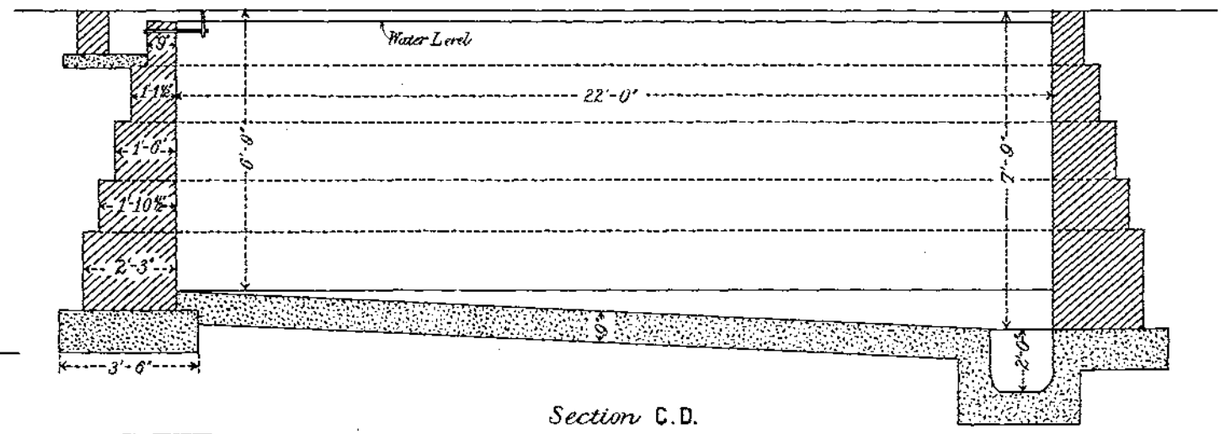


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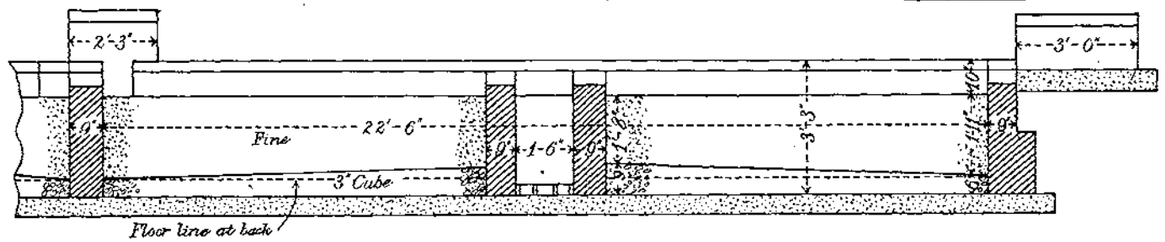


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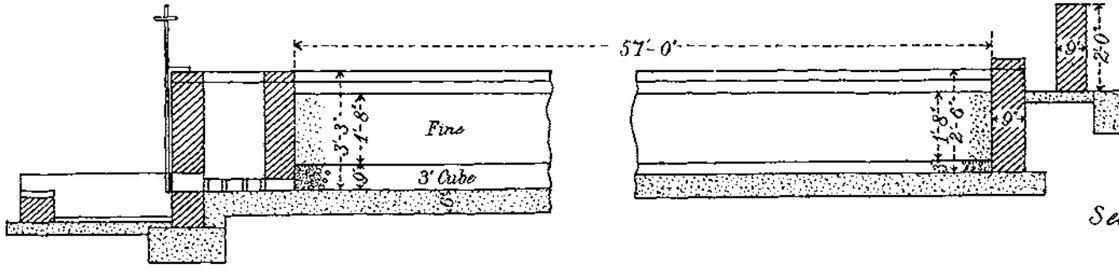


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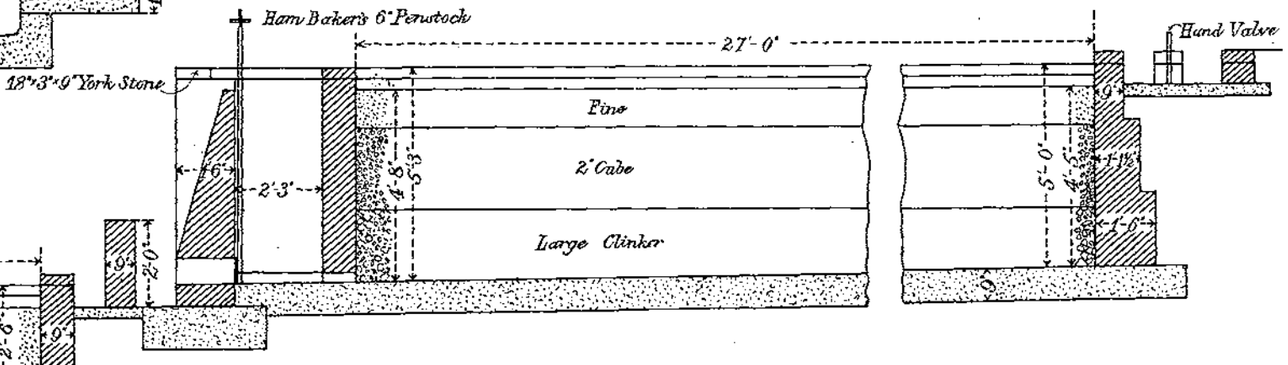

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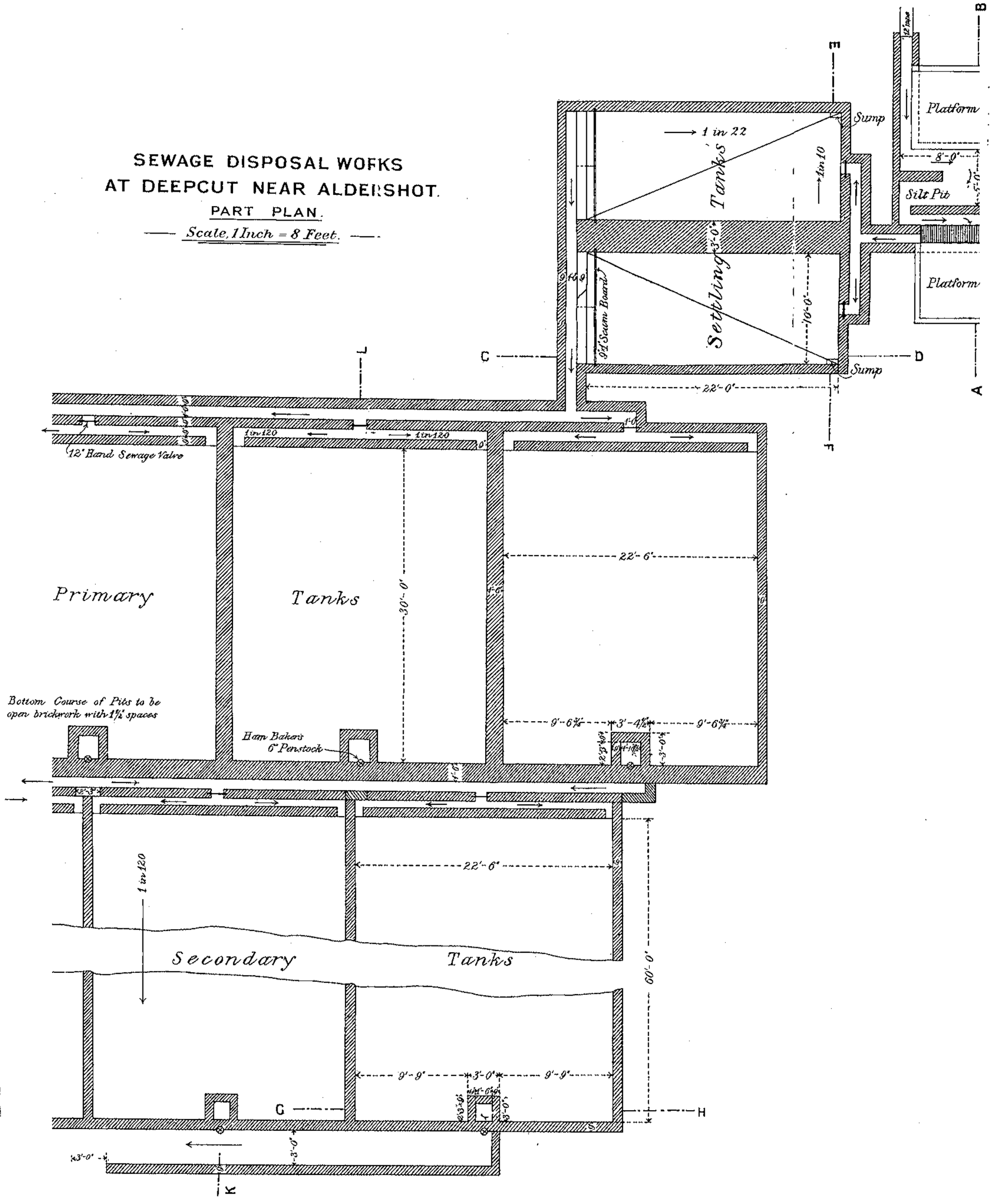

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